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THE AMERICAN GAS LIGHT JOURNAL

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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[OFFICIAL NOTICE.]

Twelfth Annual Meeting Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION,
QUINCY, ILLS., April 2d, 1889.

The Western Gas Association's Twelfth Annual Meeting will be held at Cincinnati, Ohio, on the 15th, 16th and 17th days of May. The "Grand" which has been secured by the local Committee of Arrangements for our headquarters, has been lately refitted, as well as greatly improved in all respects since the new management has assumed charge, and is now one of the finest hotels in the country. A reduction from the regular hotel rates, due announcement of which will be made later on, has been obtained for members.

A reduction in transportation rates has also been secured, for those who will be in attendance, in the territory of the Central Traffic Association, which is bounded on the East by Pittsburgh, Buffalo and Toronto; on the North by the line of, and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the North line of Cook County, Illinois; on the West, by the West line of Cook County and the Illinois and Mississippi rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the South by the Ohio river. Not later than two weeks before the date of our meeting, the Secretary will mail to every member (and to those who will kindly inform him of their intention of joining our Association) the necessary information as to how the reduction in railway fares can be obtained.

In this, the preliminary announcement of our Twelfth Annual, the Secretary desires to call the particular attention of those to whom papers have been allotted by the Committee on Assignment of Papers, that it is of urgent importance that an affirmative reply to the notices, which were sent out some six weeks ago by the writer, should be made without further delay.

The Secretary hopes to be able to announce, in the next issue of the JOURNAL, a complete list of the essays that will be presented at the Cincinnati Meeting of the Western Gas Association.

A. W. LITTLETON, Secretary.

BRIEFLY TOLD.

ON TO CINCINNATI.—Tear-laden April points the way to fragrant May, and with that bonny season comes the annual reunion of the Western Gas Association, whose call to duty and invitation to pleasure are eagerly waited for by West and East alike. Hence it is with gratification that we publish the initial official notification from Secretary Littleton of the Western gathering for '89 set for the middle days of May in Cincinnati. Persuasive Littleton seems this year to have driven the proverbial coach and four through or over the ramparts of the inter-State restrictions in respect to reduced railway fares; and it is our opinion that, if for nothing else, the Association owes to Secretary Littleton something much more substantial than a vote of thanks. Please to keep the pin at this point, gentlemen, until the afternoon of May 16th. The Grand Hotel, since its genuine rehabilitation, offers every inducement to comfort and ease. Pleasant rooms, beds disclaiming any affinity to the type Procrus-

tes, an excellent table and good service, go to make up its allurements. The Assignment Committee, having nailed its victims, has smoothed over any inequality, prospective, as to a dearth of mental pabulum; therefore, all that remains for the rank and file is to gather in numbers, so that the Western's past triumphs may be more than repeated through the last year of the eighties.

THE AUSTIN CONVENTION OF THE SOUTHWESTERN ASSOCIATION.—Dear JOURNAL: The Austin meeting is enrolled among the records of past events, and, like all pleasant and profitable happenings, it bids fair to become impressive history, wherefore, like unto history itself, it will surely be repeated. Indeed, the Southwestern was so successful that all its members wished to continue the sessions another day, and would so have decided, were it not that business appointments demanded the return home instanter of several of the delegates. The distances between cities, the limited character of the works in general, the absence of that class of helpers who can be certainly and safely depended upon as deputies on whom the care of the business can be shifted temporarily, and the general rush of Western effort to catch up with time, make it difficult for the gas manager, especially in a fast-growing city, to remain away from his sphere of action any great length of time. Brother Beck was out in the full force of his "manly and truthful character," and presided over the gathering most satisfactorily. He certainly makes a very interesting talker, as was fully evidenced by the flattery of close attention paid him by his audience. His address was timely, and though, like the meeting, short and to the point, it certainly had a good share of the latter, hence was much appreciated. There having been but two papers on the formal list, nevertheless the time was fully taken up with questions of the hour, and lively discussions of the same. Among the questions brought before the meeting were the following:

"The removal of meters where electric lights partially or almost wholly displace the use of gas? Decided in the negative, on the ground that when you have to part with a consumer it is best to separate on friendly terms.

"The placing of a frictional scrubber before condensers to facilitate the elimination of heavy hydrocarbons, without robbing the gases of such hydrocarbons as should be carried to the burner? This question brought up quite a discussion, that eventually led the participants off into various kindred subjects related to illuminants, washing, scrubbing, condensing and the making of illuminating coal gas with a residue of pitch only. The convention favored hot dry scrubbing before condensing, and washing moderately, only, at a lower temperature.

"The question as to the dual system of lighting was answered affirmatively by the majority. As argued, the advantages of the policy were based on the theory that it was a protective step to arm the gas supplier with weapons similar to those of his opponents; to master the business; and last, but not least, to make money out of the electric branch—if possible. The refrain to this latter being always couched in the key: 'If gas companies cannot make money out of the supply of electric lighting, who can?'

"The Welsbach burner was discussed, and the question of its mantles durability, and illuminating quality was overshadowed by the light's 'fog horn' accompaniment. Can any of our Eastern engineers explain the phenomena? The burner is comparatively new to us.

"The re-weights of coal was discussed, and those using Indian Territory coal testified to an average shortage of 6 to 7 per cent; and as the coal companies claim a shrinkage af 5 per cent., there is really no recourse.

"Brother Judge's paper on 'Combustion of Coal Tar Under Benches,' and a comparative statement as to results by use of the tar burner and with coke, was listened to attentively. The meeting also visited the Austin gas works, in a body, to witness the Parsons burner doing its work, and to take things in generally. Here a discussion arose as to meters that had been in use for some time failing to register small quantities of gas taken by such agencies as cigar lighters, night lights, etc., and the cause thereof.

"And then came the following conundrum. A Superintendent was incumbered with a 60 foot holder that leaked itself empty twice in a month, whereupon he let it down for repairs. During his absence, notwithstanding instructions, his foreman allowed the deposit from a heavy rainstorm to settle on the roof, which, being unsupported except by king-post and a 3 inch angle iron curb, which curb in turn was supported only by No. 14 side sheets, reinforced by six radiating tie-rods from bottom curb to king-post, from which tie-rods, 6 feet from lower curb, rise 4 inch by 6 inch wooden supports bolted into roof of angle iron curb at top, with the result that a collapse occurred from the weight of water between two of the radiating rods and wooden supports —the 3 by 3 angle iron bending down V shaped 16 inches deep, and buckling the sheets with it. The holder when in use careened a foot, and all attempts to level it threw the guide-wheels off the track. The pressure it threw was only 14 tenths; and, among other faults, it stood over a foot above tank wall, when grounded. Gentlemen; what would you advise your Board of Directors to do—repair this holder or build a new one in the same tank? The answer was emphatic. Build a new one; don't waste a cent on the old one. One member asked who built that holder; and what for. Another wanted to know whether that holder could be made tight by simple repairs, which received the following answer: 'No; there is no weight of iron to stick your repairs on.'

As Secretary Miller put it in his official notice, 'Matters of importance came up,' and were readily and pleasantly disposed of. To conclude, I submit the following notes:

"All present felt that the second annual meeting of the Southwestern was quite a success. Secretary Miller was much engaged in developing 'a fellow feeling,' which is so greatly in line with sympathy. Dell, who is nothing if not sympathetic, ought to have been there. He was sadly missed on all festive occasions.

"Col. Smallwood was, as usual, quiet in meeting, but developed his usual *forte* outside. He could not understand the abstemiousness of so many 'cowboy' gas men.

"Judge does not say much, but he thinks a mighty lot; perhaps he is 'laying low' for the electric opposition, who have fought him hard, yet not won a victory.

"The convention selected Dallas for the next annual meeting. It was said that that would keep Enfield from running away next time. Dallas is the largest city in Texas; Galveston and San Antonio crowd it hard; Austin is prettily situated; Houston is the flower garden; Waco the central, wide-awake city; but Fort Worth makes the most gas.(?)—TEXAS GENERATOR."

THE Board of Electrical Control, which has managed to pile blunder over error in its control of subway construction in this city, is now engaged in a ludicrous attempt to fasten the responsibility, *a la sauve qui peut*, for the recent upheaval at 23d street and 5th avenue. Naturally, the gas companies are called on to plead in the *role* of chief offender, but the flimsiness of the reasoning that constitutes the indictment is apparent. It is quite likely that gas was the vehicle which was responsible for the transformation for the nonce of a prominent city square into a glowing example of what has happened and will happen again in the South Sea islands and other like shaky localities; but the Ulster county powder manufacturer can hardly be called to account for a disaster that may be wrought in New York city because of the carelessness of a rock blaster. And seeking to hold the city gas companies responsible for the Fifth avenue upheaval would be on a par with such an attempt. The gas companies are not interested in the subways, other than because of the "engineers" who plotted them and prepared for their construction, the gas mains have been treated as though their only mission was to replace the earth that had been removed to make room for them. The inquiry has developed one surprising thing, and that is the enormous leakage charge patiently borne by our local gas suppliers; which, in the opinion of some of the "engineers" and "experts" at the beck of the Board, is "not less than 40 per cent." When the Board gets through with its "experts" possibly some attention will be devoted to ameliorating or bettering the existing scheme of subway ventilation—or non-ventilation. Suppression does not always afford a royal road out of danger.

LAST Monday the New York Contract Company assumed charge of the gas works at Fort Madison, Iowa. It has been decided to abandon fuel water gas and the Fahnehjelm comb, and to attempt to minister to the lighting needs of the people by supplying them with a gas that can be depended upon. We hope that Fort Madison will no longer be subjected to the eccentricities of lighting that marked the Inman regime at this point.

THE improvements—virtual reconstruction—at New Albany, Ind., are well along. The retort house and its bench equipment are completed, and the purifying plant is now under way. The new works will represent an investment of $50,000.

THE Excelsior Electric Light Company, of Chicago, will, it is said, put in a municipal lighting plant for St. Joseph, Mo.

FOUR suits for damages against the Baltimore Consolidated Gas Company have been instituted. The complaint is based on injuries resulting from an escape of gas from a street main into the premises, 1012 Hanover street.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE petition of the Danvers (Mass.) Gas Light Company to the Legislature for the right to supply electric light to the citizens will be argued on Thursday.

THE Goshen (Ind.) Gas Light Company proposes to make a stubborn defence against the suits for infringement brought against it by the National Gas Light and Fuel Company, of Chicago, Ills.

THE proprietors of the Stamford (Conn.) Gas Light Company are considering the advisability of engaging in the supply of electric light. They are now before the Legislature for the necessary charter amendments.

THE Baton Rouge (La.) lighting interests—gas and electric—have been consolidated. The new title of the Company is that of the Baton Rouge Gas, Electric Light and Power Company, which means that the Gas Company has purchased the right and franchises of the local electric light and power company. The capital of the consolidated venture is fixed at $60,000, and a new electric plant is now being installed. It is presumed that the current will be turned on early in May.

THE people of Lexington, Ky., are, with reason, complaining about the paucity of the street illumination as provided by the Council. It is rather astonishing that Lexington—and there is no other spot on this broad continent that enjoys greater natural attractions—should be so far behind in public spirit as to seemingly prefer that her streets ought to be veiled in darkness instead of being made attractive (and safe) by light. It is fair to presume that Lexington would like to rank with other coming Southern cities as a magnet for capital, but natural advantages do not alone constitute sufficient inducement for entrapping or interesting the possessor of capital. Such proprietors look for some evidence on the part of the authorities of the place whose natural resources, be they ever so prolific, are as dead fruit unless they are displayed. All of which leads to the blunt remark that Lexington would be much better off were her lighting arrangements fashioned more closely even to the pattern that obtains in a third-class town of New York rather than to the present practice there, to find a parallel for which one would have to look to a point not far from the borders of the Indian Nation.

ON March 1, 1889, Rochester, N. Y., was maintaining 2,711 public lamps of all classes. The allotment of these, with the annual total cost of same, is appended:

Name of Company.	No. Lamps.	Annual Payments.
Brush (arc)	741	$81,140
Rochester (arc)	251	26,110
Edison (arc)	38	3,953
" (incandescent)	776	14,162
Citizens (gas)	529	9,655
Rochester (gas)	161	2,938
Municipal (gas)	215	3,923
Total	2,711	$141,881

THE investigation by the Winchester (Va.) Gas and Electric Light Company—the resolve by the proprietors of the old Gas Company to enter into the dual supply having been noted some weeks ago by us—as to the most available electric lighting system for its purpose, resulted in the selection of the Schuyler type. The plant arranged for embraces two 30-light dynamos, an 80-horse power boiler, and a 70-horse power engine. The wiring is now underway, and it is expected that current will be sent out on or before the first prox. The Company's contract with the city calls for 45 arcs of 1,500-candle power each.

THE annual meeting of the stockholders in the Chicago Gas Trust is set for April 25. Apart from the ordinary routine business, such as the reception of reports and the election of a Board of Directors, the meeting will consider the feasibility of a proposition for supplying the city with natural gas. It is well to bear in mind that no shares "transferred, of record subsequent to March 23, will be entitled to vote at said meeting."

THE fuel gas works at Troy, N. Y., are on the high road to rehabilitation. The proprietors promise to distribute gas "for fuel and illuminating purposes" in that portion of the city north of Broadway, on or about July 1st.

WE are in receipt of a reminder (in the shape of an invitation) from Secretary Decker that the annual meeting of the American Water Works Association will be held at Louisville, Ky., on Tuesday, Wednesday and Thursday of next week. Judging from the history of the eight reunions of this Association, the ninth is sure to prove a profitable and enjoyable gathering. Those who attend are to be comfortably housed, since the Galt House has been selected as headquarters. No less than 15 papers have been promised.

THE Citizens' Gas Saving Company, Washington, D. C., has named the following list of officers: W. O. Roome, President; S. O. Stockslager, Vice-President; S. H. Gresy, Secretary; John O. Johnson, Treasurer; W. B. Matthews, General Manager. It should also have named Senator Spooner to some responsible position. How would he do for a Board of Directors?

THE stock of the St. Louis Thomson Houston Company has been increased to $500,000, from $150,000.

TOWARDS the close of March, Messrs. Jas. Green and L. M. Rumsey, of St. Louis, Mo., acting presumably for the Sedalia (Mo.) Gas Light Company, purchased a controlling interest in the Sedalia Electric Light Company. This ends a protracted and bitter competition for the control of the lighting interests of Sedalia. The sale was hastened by a determination on the part of the gas men to invest in complete modern electric plant. Mayor Crawford, of Sedalia, is said to scent "danger to the city" in this consolidation; for he asserts that the municipality is now completely at the mercy of Messrs. Green and Rumsey, so far as the public lighting is concerned. Sedalia usually makes a 5-year contract in this respect, and as the one signed in 1884 either has ended or is about to terminate, the Mayor recommends that the city take steps to operate an electric lighting plant on municipal account.

THE local papers predict that the Macon (Ga.) gas war will soon be a thing of the past, both parties to it having tired of the struggle. The charters of both companies contain clauses preventing combination or sale one to the other, but this does not preclude an agreement to raise prices and a virtual districting of the city. There are many ways, of course, in which a deal could be cemented that would be perfectly legal; and there is no reasonable doubt but that the end must soon come. This affair at Macon, however, teaches anew the old story. A rapacious Council, by an improper use of power, permits capital honestly invested to be mulcted by adventurers, and also saddles an increased gas tax on the inhabitants. Certainly, if this deal is effected, Messrs. Starr and Van Steenbergh will have cause for chuckling.

THE Chester (Ill.) Power and Illuminating Company, recently incorporated by Messrs. J. B. Hockridge, A. G. Gordon and J. D. Gerlach, has decided to abandon the construction of a gas works, and will install an electric plant instead.

THE authorities of St. Joseph, Mo., having been seized with the munipal electric lighting plant fever, invited bids from the electricians for the necessary apparatus. Several estimates were submitted, but no choice, as we understand it, was made, because the city would not award a contract unless the recipient would agree to guarantee that the annual cost of each lamp, for maintenance, would not exceed a stated sum.

THE Council of Portland, Oregon, having granted a renewal of the contract for lighting the city to the Willamette Falls Electric Company for a period of two years, Mayor De Lashmutt returned the same to Council with his disapproval. His Honor's objections are, to say the least, of a very fanciful nature, and are chiefly based on the sinfulness of awarding a contract without competition. In this respect, the Mayor says: "This is a renewal for two years with this Company upon a proposition from them, without giving others an opportunity to bid for it. This policy is pernicious in its inception, and can only be followed by evil results. No matter if we deem the proposition reasonable, still new and important improvements are constantly being made in the utilization of electricity, and I take it that none of us can know just what can be done, excepting we give parties in the business an opportunity to bid for such work; besides, I deem it a self-evident proposition that all important expenditures of the people's money should only be made as a result of a healthy competition." It seems to us his Honor puts the case in a very strained way.

A REPORT from Baltimore is to the effect that the Consolidated Gas Company of that city has arranged for the issue of a 50-year mortgage in $7,000,000, to bear 5 per cent. interest, in order to take up the outstanding certificates and to provide for redeeming the 6 per cent. bonds

as these come due. As all these requirements are not in excess of $6,500,000, it becomes a question of interest as to the disposition of the balance; and the remaining half million, we are told, will be expended in betterments, the major allotment going to provide for the manufacture and distribution of fuel gas on a large scale. We understand that Mr. Hambleton has been a close student of this problem for no little time, and that the results of his studies will likely prove a pleasant surprise to the fraternity. It would be a revelation were quiet Baltimore to have the glory of truly solving the fuel gas enigma.

In respect to the consolidation at Fargo, Dakota, a correspondent sends the following: "The Fargo Gas Light and Coke Company and the Fargo Incandescent Light Company have been consolidated, and a new Company incorporated, known as the Fargo Gas and Electric Company, with a capital stock of $250,000. Over $100,000 of this has been paid in, and the new company has purchased not only all the property and interests of the two enterprises above named, but also the Brush system local venture for street lighting. The officers of the Company are: President, V. S. Stone; Vice-President, H. F. Miller; Secretary, S. Newman; Treasurer, J. W. Smith. It is the intention of the proprietors to extend the incandescent light supply not only to the residence portion of the city, but also to the adjoining town of Moorhead. To accomplish this, large plant additions will have to be made. Fargo grows amazingly, and I think the venture above noted will result in profit to its conductors. We here think most favorably of it, for it is controlled by local capital, and its managers are of the sort who do not think that extortion is the high road to prosperity and safety.—New Star."

The Davis & Farnum Manufacturing Company, of Waltham, Masss., has determined to secure a decidedly liberal percentage of the business favor that the gas makers of the Eastern section have to bestow on the manufacturers of gas apparatus—which should not be interpreted as meaning that Messrs. Davis & Farnum do not enjoy a pretty good share thereof at the present time; for they do. Yet as capacity has much to do with one's ability to take hold of many contracts, the bidder must necessarily feel some uneasiness over the prospect that to use a homely phrase, he might bite off more than he could comfortably chew. A casual inspection of the Davis & Farnum shops, as constituted a year ago, would be apt to impress one with the belief that these were ample for any possible demand that could be made upon their resources, and while D. & F. never yet failed to come to time on any job awarded them, their new plant will not only enable them to take any and all orders, but will also permit their execution with greater ease. The principal additions have been made to the sheet iron shops, which have been fitted up with a complete equipment of tools to facilitate the rapid handling of holder work. That such action was necessary is shown by the holder contracts now underway for Chelsea, Milford and Norwood, Mass., and at Yarmouth, N. S.—which latter item points to the fact that the whole Dominion of Canada does not find it incumbent to depend on the "Mother Country" for such work. In the meantime we might say that the Davis & Farnum Company is completing contracts for other gas apparatus (purifiers, condensers, etc.) at Salem, Taunton and Fall River, Mass.

There is a very fair prospect that the bill (presented by Mr. Miller, of Cook County, Ills.), to clothe municipal corporations of Illinois with power to construct and operate gas and electric light works will be reported unfavorably. The sentiment of the Committee on Municipal Corporations, who have it in charge, is decidedly adverse to it.

The Committee on Manufactures of the Massachusetts Legislature is still discussing the Mellen bill to commit the manufacture and distribution of gas and electric light to the public authority. Among those who recently spoke against it was Mr. Geo. Shepard Page, of this city, who made some good points in opposition, not the least of which was that in the cities of this country now operating the local gas supply (four in number) the average price charged was higher than that obtaining in cities, similarly situated in respect to the factors of manufacture and consumption, where the supply was in control of private capital.

A good, permanent black color may be imparted to ordinary building bricks by immersing them in a warm bath of asphalt and linseed oil.

The authorities of Marietta (O.) have determined to install a municipal electric lighting plant, at an estimated cost of $15,000.

The maximum daily manufacturing capacity of the various works in New York City, is returned as follows—quantities in millions cubic feet: Consolidated, 28; Mutual, 4; Equitable, 6; Standard, 2½. Of the suburban companies—quantities in thousands cubic feet: Central, 700,000; Northern, 250,000. The main mileages are: Consolidated, 755; Mutual, 122¼; Equitable, 112¼; Standard, 91½; Central 53; Northern, 34.

Batavia (N. Y.) wants a municipal lighting station of the arc type, and to satisfy that desire the Westinghouse Company is striving. In the meantime the local Gas Company, which now lights the village from its electric annex, offered to sell the latter to the authorities. This desire on the part of cities and towns to operate electric lighting stations ought to act as a damper on the enthusiasm of the thick-and-thin proponents of the idea of dual supply. If Batavia does decide to make the electric venture the plant will be installed in the water works pumping station.

Mrs. Wilson, of Alton, Ills., sustained injuries to person through a fall occasioned by a poorly-guarded excavation for burying a pipe, conducted by the Alton Gas Light Company in a main laying operation. She brought suit against the Company, and secured a $750 verdict.

Mr. James Green, President of the Laclede Fire Brick Company, St. Louis, Mo., mentioned elsewhere by a correspondent as having been a prime mover in the purchase, by the Sedalia (Mo.) Gas Company, of the electric light interests at that point, denies any connection therewith. And Mr. Green ought to be as well posted about this as anyone else; for he is the principal owner of the Sedalia Gas Company.

The Williamstown (Mass.) gas plant is to be arranged for "pure oil gas," as was intimated in our last would be the case. This is to be regretted, for, with the extremely low temperature often experienced at Williamstown in mid-winter, much dissatisfaction with the system is sure to result.

We understand that the proprietors of the Omega process have disposed of their "rights" for the State of Missouri to Mr. Fred. F. Espenschied; who is said to have paid $5,000 in cash for the property. As a politician Mr. E. is more or less of a success—he is Treasurer of the city of St. Louis—and as politicians are apt to "know the ropes," perhaps he scents profit in the Omega venture. At any rate he did not go into the thing blindfolded, since he was cognizant of the testimonial published in the Journal, over the signatures of Messrs. Judson and Forsall, of Chicago; in fact we have it on the best of authority that his knowledge of these "testimonials" enabled him to knock $5,000 off the sum originally asked for the Missouri "rights" to the patents in question.

There cannot be doubt any longer that "parties with great influence" are behind the scheme to push fuel gas in certain Western States, notably Ohio, Michigan and Indiana. Latitude is all that is necessary to develop the characteristic disinterestedness of some public-spirited (?) men!

The Greencastle (Ind.) Council has determined to try a mixed system of public lighting. To that end 14 arcs, at $72 each per annum, are to be placed at the most prominent points, while gas lamps, at $14.28 each, will illuminate the bye-ways.

Solomon Bergman has brought suit against the St. Paul (Minn.) Gas Company, by which he seeks to recover $10,000 for damages to tenement property owned by him in what is known as Kittson's addition to the city. His houses (which are on lots 7 and 8 in the addition and block 41, adjoin the Gas Company's works on Fifth street) he claims are rendered untenantable because of the smells arising from the manufacture of large quantities of gas, hence that their value and enjoyment to him are permanently impaired. It is said that no matter what the initial judgment shall be, the case will eventually be passed upon by the United States Supreme Court.

The contract for filling in the space to the rear of the new bulkheads of the Yonkers (N. Y.) Gas Light Company has been secured by Messrs. John D. Bailey & Brother, of this city. The price agreed on is about 27½ cents per cubic yard. About 52,000 yards will be required.

The Pueblo (Col.) Gas and Electric Light Company is putting the finishing touches to the main extensions recently put down in the north end of the city, in which section the greatest building development has taken place. Four miles of mains were buried, which proves that gas is still King in Pueblo.

The Philadelphia Gas Improvement Company, when it agreed, in 1888, to install a water gas plant in the old Trust works, bound itself to complete the task by Dec. 15, 1888, or else forfeit a certain sum for each

day that it was behindhand in the premises. We believe that the Company was short three days of the stipulated time, but we did not suppose that the city would exact the penalty. This inference, however, was all wrong, for on Mar. 30 General Wagner received the pound of flesh —blood and all—in the shape of a check for $2,182.

THE Worcester (Mass.) Gas Company has declared a quarterly dividend of 1½ per cent.

ONE of the questions settled in the affirmative—submitted to the voters of Zanesville, Ohio, at the municipal election held there last week—was the proposition to grant a franchise to the "Ohio Fuel Gas and Incandescent Lighting Company," the same to include the right to pipe the streets, etc. The proprietors propose to use the system in vogue at Jackson, Mich., and have agreed to furnish the gas at the rate of 40 cents per 1,000 cubic feet, when used for illumination alone, or at 30 cents when a lighting and fuel service is ordered. In order to convince the voters a certain Colonel Boone had a specimen plant ("thrown together at short notice") in operation in a part of the local premises known as the Black Diamond building. There is something suggestive in all this, for it is quite likely that Boone and his backers will sell the food—their's to be the profit—whereas the absorbers will subsequently be engaged in the attempt to digest it. Rich for digestion; beyond a doubt—too rich, we fear, considering the average uneven allotment of gastric juices.

DIRECTOR WAGNER is much pleased over the work being performed by the Ross discharging machines at the 26th Ward gas plant. In respect thereto he says: "Their work has been of such a satisfactory character that other machines will be put into operation as soon as they can be built and the retort houses and stacks adapted to their use." In fact, as already stated in the JOURNAL, 2 sets of Ross machines are to form a portion of the new equipment consequent on the rehabiiltation of the Point Breeze station of the Philadelphia works.

MEANWHILE the attention of the amateurs who are so blatantly advocating the adoption by cities of municipal lighting stations—either electric or gas—is called to the fact that the cost per thousand cubic feet of gas distributed from the Trust works in 1884 is returned at $1.31; and even with all the betterments that have been made on the plant since then, representing hundreds of thousands of dollars, the cost per thousand for 1888 is returned at $1.02. Were the Philadelphia works under private control, we venture to say that gas could be sold there at $1.02 per 1,000, with a good profit to its suppliers—provided, however, that the operators were not obliged to employ the ramshackle main system that has been handed down to Director Wagner as an unfortunate legacy from his predecessors in charge.

AT a meeting (held last week) of the Dedham (Mass.) Selectmen, a resolution was passed indefinitely postponing the application made by the Dedham and Hyde Park Gas and Electric Light Company for consent to plant poles and string wires. The Selectmen then voted to light the streets by electricity, and appointed a committee—comprising Messrs. F. D. Ely, H. C. Bonney, S. H. Hathaway, J. W. Chase, W. W. Baker, Thos. P. Murray, L. D. Wilcutt and A. B. Wentworth—to make the necessary bargain. The committee, however, had some hard and fast rules prepared for its guidance, or without which it might not go. The rate per annum is not to exceed a total of $5,000, the contract may not be made for a longer period than 10 years, the price per arc (1,200-candle power) not to exceed $70 per year, and the charge for 26-candle incandescent lights to be not in excess of $17 per annum. From this it would seem that the Selectmen attached a stout cord to its agents.

THE amendments to the by-laws of the Boston Gas Light Company, as determined, are as follows: *First.*—Article III. of the by-laws shall be amended by omitting the word "five"—referring to number of Trustees—in the first line, and substituting therefor the words "not less than seven;" also, by omitting the word "three" in the tenth line, and inserting the words "a majority." *Second.*—Article IV. shall be amended by omitting therefrom the words "every officer except the Clerk shall be a proprietor." *Third.*—Article V. shall be amended by omitting the words "Provided that no member shall have more than one-quarter of the whole number of votes of the said Company." *Fourth.*—Article X. shall be amended by omitting the words "nor less than ten," and "actually present."

MR. JONAS D. TOWNSEND, after an illness covering a period of five years, died at his home in Dover, N. H., on Mar. 29. Deceased had for many years been Superintendent of the Dover Gas Light Company, and had been a member of the State Legislature for four terms. He had also been a Selectman of Dover for seven terms.

THE Clinton (Mass.) Gas Light Company has ordered an incandescent electric lighting plant from the Thomson-Houston Company. In connection with the latter we regret to say that our query in connection with the possible identification of a "wicked partner" with its many schemes remains unanswered. Does silence mean consent?

SOME time ago we noted the incorporation in Philadelphia of the Quaker City Fuel Gas Company, which proposes to establish plants in Philadelphia for the supply of fuel gas. It is now before the Councils for an ordinance. The incorporators are: John S. Davis, Prest. of the Oil Exchange; Fred. P. Hayes, Prest. of the Pennsylvania (natural) Gas Company; Edward T. Steel, Hamilton Disston, and Congressman H. H. Bingham. Mr. Davis, when interviewed as to the outlook, replied: "The capital stock on which the application for a charter was made is $20,000; but, of course, that does not represent the working capital of the concern. It is merely a nominal sum, stated in order to get the charter. We have the privilege under the new law to increase it to $5,000,000. Our first object was to get the charter, and we did not care to make the capital any heavier than we could help until we were certain of getting the privilege from the city, as we were compelled to pay the State one-quarter of 1 per cent. on the capital named in the charter. In case the ordinance is allowed we are prepared to expend $1,500,000 on the plant at once. The company is not in any way connected with the Tacony Fuel Gas Company, and Mr. Disston, of that company, comes into the Quaker City Company as an ordinary shareholder." The Quaker City folks intend to operate in the 24th and 27th Wards, believing that the large mill interests in these sections will amply support such a venture.

THE agents of the Toraya gas process have visited St. Louis, Mo., although their plan, as ventilated there, was to introduce the system in the smaller towns. St. Louis is a good basis for starting incursions over the great southwestern territory.

MR. W. L. B. ALLEN, who is a most clever electrician, has been trying a 15-horse power Otto gas engine in the electrical experiments now being carried on at the works of the Laclede Gas Company. Among other things the engine carried in most perfect manner ten arc lights of 2,000-candle power each. Mr. Allen is also on record as believing that the gas consumed in an Otto engine for maintaining incandescence lamps yields 15 per cent. more illumination than were the gas consumed direct through ordinary burners.

DIRECTOR WAGNER has awarded to Messrs. R. D. Wood & Co., Phila., Pa., the contract for a three-lift gasholder, wrought iron tank, to be erected at Ninth and Miflin streets in the Quaker City. The holder is designed to have a capacity of 1,500,000 cubic feet, and is to have the following (approximate) dimensions:

Inner Section.	Middle Section.	Outer Section.
155 ft. diam. by 28 ft. high.	157 ft. 6 in. by 28 ft.	160 ft. by 28 ft.

The tank is to have a diameter of 162 ft. 6 in. by 29 feet high. Notable circumstances in connection with this undertaking are that it is to be the first three-lift holder ever erected in Philadelphia, and the first trial there with a wrought iron tank.

WE can add nothing to the force or teaching of this "strong" notice by commenting thereon—save that it places Mansfield on the list as the banner cheap gas town, all things considered. Here is the evidence:

OFFICE MANSFIELD GAS LIGHT CO.,
March 23, 1889.

The thanks of our Company are extended to our citizens who so generally extended courtesies to the members of the Ohio Gas Association lately in session in our city.

We have the further pleasure to announce, in consequence of the improved appliances recently introduced by the Company for the rapid manufacture of a high candle power gas, that, taking effect April 1st, the price of gas used for illuminating purposes will be reduced to $1.25 net per 1,000 cubic feet, and for gas used for cooking, heating and power, the price will be $1 net per 1,000 cubic feet.

Ordinary connections will be made free of expense, but where it may be necessary to set an additional meter a small monthly rent may be charged.

These rates will be found lower than in any other city in our State, considering our output, and are made in the confident expectation that they will be so appreciated as to make a handsome increase in the use of gas and justify the very low price. L. A. STRONG, Prest.

The Manufacture and Purification of Bisulphide of Carbon.

The London *Journal* reports that a practical paper on this subject was read at the last meeting of the Manchester Section of the Society of Chemical Industry, by Mr. Ignatius Singer. He remarked that, although the chemical reactions concerned in the manufacture are of the simplest kind—involving only the direct combination of the two elements by passing sulphur vapor over red-hot charcoal in a closed retort, and condensing the bisulphide of carbon which distils over—many technical difficulties are encountered, chiefly on account of the great inflammability and poisonous nature of its vapors. Great care is necessary to prevent all access of air to the apparatus, as bisulphide vapor combined with air oxygen is not only explosive, but produces carbonic acid and sulphurous acid. Vertical iron or earthenware retorts, about 6 ft. high and 22 by 12 in. in internal diameter, capable of making from 4 to 5 cwt. per 24 hours, were used; and at first it was not an easy matter to make all the joints air-tight, as there must be openings for the introduction of sulphur and charcoal (the former every few minutes), for the delivery of the vapors, and for the withdrawal of the ashes. It is necessary that air should be perfectly excluded from the generating retort, as no bisulphide will be formed while oxygen is present, because sulphur had a greater affinity for oxygen than for carbon. Another difficulty was the quantity of uncombined sulphur which distilled over and tended to choke up the exit pipes and condensers. Every few days the apparatus had to be opened to remove the accumulated sulphur—an operation not free from danger in the absence of proper arrangements.

The oldest apparatus for the manufacture of bisulphide of carbon on a commercial scale, as used by Peroncel in France 40 years ago, was described, with the aid of an illustration taken from "Richardson and Watt's Technology." The retort, which was 6 feet long by 12 inches in diameter, was capable of producing 2 cwt. per day, and only lasted about a week. This has been so far improved upon that the productive capacity is doubled, and the retorts will last 60 days more. Charcoal is now used almost exclusively as the source of carbon in the retort, having been found to yield better results than coke. Mr. Singer proceeded to point out other defects in this apparatus, which had been remedied in more modern plant; and he made an observation that will be specially interesting to gas engineers. It was that charcoal contains a considerable amount of hydrogen; and when a fresh charge was introduced, no bisulphide would be formed until the whole of the hydrogen had passed off in the form of sulphuretted hydrogen. On this account an oxide purifier is a necessary adjunct to the outlet of the condenser. After a few more historical incidents had been mentioned, the most interesting part of the paper, consisting of a very full description of the best kind of appartus at present known, was reached. This was illustrated by a large sectional diagram. The sulphur, first melted in a separate vessel, is admitted into the retort in a fluid state, by means of a tube fitted with a plug-valve. The eduction-pipe is large, and inclined upwards away from the retort. Bending at an obtuse angle, it descends into a large vessel, from the outlet of which it has a straight run of about 30 feet. This part is surrounded with a water-jacket, and sloped downwards towards a receiving vessel, from which a pipe leads to the purifiers. The liquid is received into a closed reservoir, and raised to an overhead storage-tank by means of compressed air. Cleaning-doors are provided at all angles, so as to command the whole length of pipe, for the purpose of clearing out the condensed sulphur; and the condensing vessels are furnished with movable covers, sealed in hydraulic seals. The purifying apparatus consists of a sort of scrubber, supplied with vegetable oil to absorb residual bisulphide, and of an oxide purifier. A smaller retort, set above the main retort, is used for heating up the charge of charcoal. A fresh charge is required every eight hours; and the small retort is so arranged that its contents can readily be "drawn" into the larger one. By this means a charge of fresh charcoal at the proper temperature is secured without loss of time, and without cooling the retort. A cherry-red temperature is found to be the best; and variation either way from this results in a lower yield. The whole apparatus requires to be cleaned out once a week.

The product obtained by the process above described contains a considerable quantity of sulphur, also sulphureted hydrogen and other sulpho-compounds, which impart to it a pale yellow color and a disagreeable odor. There is only one method cheap enough for employment on the large scale, and that is to treat the bisulphide with lime water until the latter flows off perfectly clear, then to pass it into a still, add about 1 per cent. of a cheap colorless oil, cover it with a layer of water an inch deep, to which some sugar of lead may be added, distill in a water-bath, and condense in the usual way. The paper concluded with a list of numerous commercial uses to which bisulphide of carbon is applied.

Watson's Reversible Hydraulic Gas Valve.

Mr. G. Watson, of Birmingham, England, claims to have greatly improved his patent valve of the above-named type. The new type differs from the old in that the tell-tale has been dispensed with, and the valves are made to pass gas under pressure when they are shut, thus acting as an ordinary dip-pipe until opened. The general advantages of the valves are thus summarized: (1) Dispensing with the dip pipes, which will relieve the retorts of the pressure formerly caused by the gas having to pass through the water, and so prevent a large amount of gas being consumed or destroyed in the retorts. (2) The condensation caused by the gas at so high a temperature coming into contact with the water will be avoided. (3) Prevention of deposit of carbon in the retorts and pipes, which is caused by the pulsatory action of the gas passing through the water in hydraulic main. (4) A larger make of gas per ton of coal carbonized. (5) The old hydraulic main may be converted into a dry one, and thereby facilitate the passage of gas. (6) The valve acting as a dip-pipe until opened.

The cover is jointed with an asbestos rope or washer, about ⅝ of an inch thick, which lies in a groove cast on a flange that projects inside the valve-box, thus enabling the lid to be removed and replaced in a few minutes without removing the packing.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Infringement Proceedings Instituted by the National Gas Light and Fuel Company.

OFFICE NATIONAL GAS LIGHT AND FUEL CO.,
CHICAGO, March 29, 1889.

To the Editor AMERICAN GAS LIGHT JOURNAL:

We have brought infringement suits against the Goshen (Ind.) Gas Light Company and the Creston (Iowa) Gas Light Company. These Companies are employing an apparatus in the manufacture of gas which was built for them by Messrs. Henry Pratt & Co., of Chicago, and is advertised by said Company as the Pratt & Ryan system of water gas manufacture. We desire through your columns to notify all parties that we are advised that the so-called Pratt & Ryan apparatus and process are clear infringements upon the Springer patents owned by us, and that we shall promptly proceed against all persons or companies found using such apparatus in the manufacture of water gas without license first obtained from us.

We take this occasion to say that the water gas apparatus, erected in 1887 at the works of the Illinois Light, Heat and Power Company, of Chicago (controlled by the Peoples Gas Light and Coke Company), as built under the Springer patents, and not, as is intimated in advertisement of Henry Pratt & Co., under Pratt & Ryan patents; in proof whereof we refer to letters from Peoples Gas Light and Coke Company and Illinois Light, Heat and Power Company, which we herewith forward for publication. Yours respectfully,

NATIONAL GAS LIGHT AND FUEL CO.,
Per C. D. HAUK, General Manager.

[The correspondence referred to by Mr. Hauk is appended.]

OFFICE OF THE PEOPLES GAS LIGHT AND COKE CO.,
CHICAGO, March 1st, 1889.

NATIONAL GAS LIGHT AND FUEL CO., CHICAGO, ILLS.

Gentlemen:—In 1882 we put in our first set of Springer apparatus, and, after a thorough test, both as to quality and cost of gas produced, adopted that system. We have since, as necessity demanded, increased our capacity by additional sets of Springer cupolas.

No other water gas apparatus has ever been employed at our works; and an exhaustive trial of seven years duration convinces us that the Springer cupola system of gas manufacture is the best known. The apparatus is safe, economical, easily handled and produces a strong, well fixed gas. Very truly yours,

PEOPLES GAS LIGHT AND FUEL CO., PER JOHN ZIMMERMAN,
Secretary.

OFFICE OF THE ILLINOIS LIGHT, HEAT AND POWER CO.,
CHICAGO, March 1st., 1889.

NATIONAL GAS LIGHT & FUEL CO., CHICAGO, ILLS.

Gentlemen:—The Division Street works were built in 1883, after a thorough trial had been made of the Springer cupolas at the 22nd Street works. The result had demonstrated the superiority of that system: and all plans were made with a view to the exclusive employment of Springer cupolas. These plans were carried out, and no other system has ever been employed at these works, the present capacity of which is 6,000,000 cubic feet daily.

Our adoption of the Springer cupola process of manufacture at this new station speaks more eloquently for your system than any testimonial which could be written. Very truly yours,

ILLINOIS LIGHT, HEAT AND POWER CO., PER JOHN ZIMMERMAN,
Secretary.

(Concluded from p. 417.)

[Official Report—Revised by the Secretary.]

Fifth Annual Meeting of the Ohio Gas Light Association.

Held at the Elks' Hall, Mansfield, Ohio, March 20 and 21, 1889.

First Day—Afternoon Session.

The sessions of the Association were resumed at 1.30 P. M.

The President—Next upon our programme is a paper, on the subject of

GAS MONOPOLY,

by W. W. Cantine, Alliance, Ohio.

The definition of the term monopoly according to the *Britannica*, though still used in the sense of the original Greek, meaning "exclusive sale." In Great Britain the term was more accurately applied only to grants from the Crown or from Parliament. The private act of an individual, whereby he obtained the control over the supply of any particular article, being properly defined as "engrossing." It was from this practice of the Sovereign granting to a favorite, or as a reward for good service, a monopoly in the sale or manufacture of some particular class of goods, that the system of protecting inventions arose; and this lends additional interest to the history of monopolies.

When the practice of making such grants first arose it does not appear easy to say. Sir Edward Coke laid it down that by the ancient common law the King could grant to an inventor, or to an importer of an invention from abroad, a temporary monopoly in his invention; but that grants in restraint of trade were illegal. In the first case, in 1602, such was the law laid down, and this decision was never overruled, though the law was frequently evaded. During the reign of Elizabeth patents of monopoly were so freely granted that the practice became a gross abuse, as many of the common necessaries of life were subject to monopolies, grievously enhancing their price. thus using their privileges for purposes of extortion.

In 1623 the Statute of "Monopolies" was passed, making all monopolies illegal, except such as might be granted by Parliament or were in respect of new manufactures or inventions. The representatives of the ancient practice are recognized in the licenses taken out by dealers in wines, spirits, tobacco, etc., while quasi-monopolies enjoyed by railroads, canals, gas and water companies, are lineal descendants of the old monopoly grants.

The English doctrine still is that municipalities shall not enter into any business that private individuals will undertake. Let me quote from the *North American Review:* "By actu l statistics it costs cities from two to five times as much to run their own gas and water works as it does when such enterprises are in the hands of individuals."

By giving such enterprises to their citizens they also get rid of their sources of corruption and theft. The theory of all governments like Rome, Russia, etc., is to monopolize, or at least to control all these matters. The water works of Rome were built by slave labor and run by the government. This was also true of Paris, St. Petersburg and other Continental cities, and China and Mexico, while free London is supplied by private companies.

The popular American cry seems to be for the government to own railroads, telephone and telegraph systems. This is an encroachment on the theory of our institutions, and any legislation, including inter-State commerce laws, which goes beyond the province of police control, is a step towards governments of ancient Rome and modern China. One of the most potent reasons why gas should be a monopoly is that we cannot take our commodity to any market other than the one where the works are located. The difference between the gas business and any other business is simply this. The manufacturer, becoming dissatisfied with his location by reason of lack of proper material or insufficient shipping facilities, and tempted by free gas and a fat bonus, can easily fold his tent and bid farewell to his native town forever. Not so with the gas company. Who ever heard of one leaving a town or city in disgust? It cannot be done. The investment may be bad, but is nevertheless permanent. A large percentage of the capital lies buried in the earth, too far removed even for the tax gatherer to reach.

Until quite recently gas making was a practical monopoly in nearly all the cities and towns of this country in particular. This commodity was sold at a figure, generally, I may safely say, twice the present average price. It will be remembered that at two points in the United States —Jackson, Miss., and Easton, Md.—gas was sold at $10 per 1,000 cubic feet. Nearly all gas works favorably situated and properly managed have paid somewhat larger dividends since the year 1865 than could have been realized on almost any other local investment. This fact becoming known or suspected, seems to have aroused the base passions of envy and jealousy in the bosoms of those who, perchance, may have been among the original incorporators of a gas company, but, not possessing the staying qualities or courage to "labor and to wait," dropped out, one by one.

It is the history of nearly every gas company having an existence of 20 years that it became a close corporation in consequence of the number of stockholders becoming so greatly reduced in the first few years of its career. There is a striking similarity in regard to the genesis of all gas companies. A town begins to assume proportions that will permit some light better than the oil lamp. There are in every community, however small, a few really enterprising citizens. The question of forming a gas company is suggested, and soon is freely discussed on the street corners and in the family grocery; consequently a meeting is called, and the villagers assemble in the principal hall of the town. The response to the call is surprising, considering the financial status of the majority. The chairman and other officers of the meeting are promptly chosen. The object of the meeting is stated. All the streets on the plat of the village are to be underlaid with gas mains and brilliantly lighted. The plan is to be co-operative; every property owner should be a stockholder, somewhat after the manner of a granger store, all participating in the profits. Every motion made is carried without a dissenting voice. A partial organization is effected. The meeting adjourns, and the villagers retire to their homes with the proud consciousness that they are soon to take on metropolitan airs. In due time a subscription list is circulated, and a gratifying sum is placed opposite each name. Thus fortified, an application is made for a certificate of incorporation, and the company is soon launched on the commercial world. As the sinews of war are needed, the local patriotism of fully one-half who deal mostly in "futures" is conspicuous for its absence, as the experience of many can testify. A few of God's noblemen that remain carry the work to completion. The struggle now commences. Consumption is small, and in consequence the price is necessarily high; and the earnings must be expended for service pipes, meters, and extensions. No dividends are possible, and stockholders drop out with a loss of from 25 to 75 per cent.

As three Kingdoms were sifted to get the wheat that constituted our first New England colony, so the bulk of original stockholders dropped through the meshes, until there remains barely sufficient to form a Board of Directors, who in the meantime have picked up the floating stock, and thus, through force of circumstances, become monopolists.

Geographical position, or more likely accident, making it a railway or manufacturing center, has the immediate effect of making the village a city of the second class. Gas booms as well as all other interests. It is needless to ask the price of gas stock, as it is all owned and controlled by the few who have had an abiding faith in its ultimately becoming a good investment. The annual meetings are now held in the President's parlor; perfect harmony prevails in the council of the few stockholders bound together by a community of interests; dividends are declared and paid with the understanding that no reporter need apply.

Yet, during a period of nearly a quarter of a century, has the gas fraternity made as much progress in the department of their special commodity as have other manufactures? Have we not been a select party of conservatives, feeling strongly intrenched and content to let well enough alone? Competition, like necessity, may have its uses, though not always "sweet" for the time being, but acting as a stimulus to greater effort on our part to keep abreast of the times. However, many companies have shown commendable enterprise in the adoption of apparatus to facilitate the manufacture and better purification than formerly, and, consequently, a much higher candle power of gas; thus robbing the latest toy, the incandescent, of its boasted superiority, both as to power and cheapness.

In conclusion, permit me to say I am not gifted with prophecy, but in due course of time all the lighting of a city or town will of necessity be done under one management. It is generally conceded that electric light companies are not a financial success when in competition with gas companies. Nor is the public as well served as it would be under one management.

If you will bear with me a moment, I will read a paragraph from a new work upon "The Economic Value of Electric Light and Power," by Mr. A. R. Foote, that seems to be germane to this subject. The author, in respect to the question, "Should a City Own an Electric Central Station?" says:

"This question opens the whole subject of social and political economy.

"The fundamental principle of city government is that the municipal authorities shall exercise such powers only as are delegated to them by the representatives of the people acting through State legislation. The

object of city government is to secure, through corporate action, benefits that cannot be secured by private means.

"These benefits are the promotion of the welfare of the people by protecting life and property, enforcing sanitary regulations, constructing and maintaining public highways, and providing the means of education. These objects are not commercial or productive in an economic sense, and, therefore, are not prosecuted for the purpose of making a profit.

"Municipal capital is taken from the earnings of the people. Those acts of legislatures which authorize the taking of the people's money by municipal authority for the purpose of investing it in commercial or productive undertakings, to be managed without a profit, in competition with private enterprise, are not in accord with the well-established principles of a sound political economy.

"Profit making is the essential object of all industry. When a city enters the business of supplying the material necessities of the people, and conducts the business without designing to make a profit, it destroys all motive for private capital to undertake the same line of business. The logical sequence is that a city must do all the business in the line it undertakes, and do it in perpetuity, or allow private capital to do it without competition from the municipality.

"Government is an absolute monopoly. If it may monopolize one line of business it may monopolize all business. For this reason every citizen's interest is deeply touched by the question, whether a city should own an electric central station. Does he want the principle established that a municipality may undertake a business that is essentially commercial, and manage it without designing to make a profit, in competition with private capital? If he is willing to be taxed to enable the city to secure capital to be used for such a purpose? If this principle is established where will the line be drawn? If a city may do the lighting business, why not the telephone, street car, power, or any other business requiring large capital? It can get its capital by taxation. It does not have to pay taxes or interest, nor does it have to make a profit; therefore it can render cheap service. If it does borrow its capital on its bonds it simply takes authority to tax the people twice for the same amount —once for the principal and once for the interest.

"If a city's business is managed as well as that of private persons or companies, whatever it chooses to do can be done at a less cost, owing to the elimination of all charges for taxes, interest or profit, than is possible for private enterprise. Its competition, working without profit, reduces private enterprise to the condition of the slave that works without hope of reward. A city operates all it undertakes on the prison labor system —simply to make the institution self-sustaining; and it has the power to mortgage all the property in the city to make good any deficiency.

"The question, 'Should a city own an electric central station?' viewed from the standpoint of the interest of the citizen, and kept within the narrow limits of a question of policy only, can be answered in the negative without fear of successful contradiction."

These remarks apply equally well as to gas works.

Discussion.

The President—We are now ready for discussion on this paper. It is very interesting and true, and we ought to have quite a discussion upon this subject of "Gas Monopoly."

Mr. Faben—I do not see that Mr. Cantine has left much room for discussion. The paper is very complete in itself, and is a very interesting one. I move that a vote of thanks be tendered the gentleman for his paper. [Adopted.]

The President—If there is to be no further discussion upon the paper, the next paper we have is on

METHODS OF TAXATION OF DIFFERENT GAS COMPANIES, AND A COMPARISON OF THE SAME,

by Mr. H. Wilkiemeyer, Portsmouth, Ohio.

The subject of this paper is not of such character as to enable one to dispose of it offhand. It is one that requires more research than would at first be imagined; and even then, on account of the great diversity in the modes of taxation and the laws and customs of different localities, it is impossible to give the subject that detailed and acute consideration which its importance merits. To go into it in detail would involve time and labor beyond the ability of any business man to spare. It would be a task like counting the sands upon the sea shore, or an attempt to number "the leaves of Valombrosa." A comprehensive essay upon this subject—this most varied and complex subject—would occupy as many folios as the Government census report, and even then, after all the detail, it would be involved in such a labyrinth of difference that the hearer could not but be dismayed at the vast mass of data—the fine-drawn distinctions and the great variety of law bearing on the subject in its various ramifications. To evolve harmony from discord and order from chaos is the task that has been assigned me. It is no less; it may be more.

The first question involved in the discussion of this subject is: What portions of the plant and property of a gas company are to be considered as real estate and what as personalty? Even on the threshold we are met with obstacles. Courts vary in their decisions upon identical questions. The law varies in the different States, or is differently interpreted and applied in different localities in the same State. While one judge holds that a kettle in a brewery is personal property, another, just as learned and just as conscientious, will hand down an opinion for the instruction of posterity to the effect that it is so connected to the institution, so necessary to its proper use, as to be, in fact, a part of the "plant," and therefore realty. The generality of opinion, the general trend of judicial and statutory opinion and legislation, is in favor of the correctness of the opinion that all things connected with and necessary to the use of the plant could properly be classified as realty.

Whether an article is a fixture, and therefore to be considered part of the realty, is partly a question of fact and partly of law. Every case must depend mainly upon its own peculiar and distinctive circumstances (Hilliard on Real Property, Vol. 1, page 65).

The iron or wooden pipes are, without doubt, before being attached in a permanent and fixed manner to the realty, mere personal property. It is equally plain that the ground upon which the company has erected its houses, arches, ovens and holders, together with all such machinery and appliances connected with and permanently erected thereon, are, as a whole, considered and held to be real property. The pipes, then, like the other machinery and appliances, when attached or connected with the main plant, become part of the realty.

The rule is as follows: "Things personal in their nature, but fitted and prepared to be used with the real estate and essential to its beneficial enjoyment, pass with the realty and are considered part and parcel thereof." Thus, the conveyance of a saw mill passes the mill-chain, dogs and bars connected therewith; that of a brewery passes a malt mill attached to it and necessary for its proper use; that of a cotton mill passes the water, flood-gate, and also machinery.

The great distinction between personal property absolute, and personal property so connected with and attached to the realty and so necessary to its use as to lose its personal character, is this: That when a thing is a necessary accessory to the enjoyment of the inheritance (meaning realty) it becomes a part of the inheritance. The pipes and mains of a gas company are absolutely necessary to the proper use and enjoyment of a gas manufacturing concern. Without such pipes and mains the plant would be absolutely worthless.

There is justice in the rule. Let us apply the test. Suppose that an execution should issue against a gas company. It is the duty of the sheriff to levy, first, upon personal property of the debtor. Suppose that, in the absence of other personal property on which to levy, he should consider the mains as such and levy upon, appraise and advertise them for sale and should offer to sell them. By such sale would not the value of the entire plant be destroyed? Of what use would either the mains or the plant be if one part were owned by one party and the other by a stranger? Would any court in the land allow such injustice to be done? Certainly not. In such case the court would undoubtedly find that the mains and pipes were necessary to the proper use of the plant, and the plant necessary to the practical use of the pipes. In the language of the rule, the court would say: "These mains and pipes are fitted and prepared to be used with the real estate, and are essential to its beneficial enjoyment." The mains are not personalty, and a sale of them, as such, would be set aside as unjust, because it would render the plant worthless.

Therefore, if for purposes of sale, the pipes and mains of a gas company are held and to be considered realty, they are certainly so when considered with reference to taxation. They are part and parcel of the whole concern, and are, for all intents and purposes, either of sale or taxation, as much real property as the ground upon which the retorts stand. They are not severable without injury to the whole. Therefore, the law unites the personal and the real, and calls the product *Realty*.

Now, having established the fact that the mains are realty, it is but a step further to conclude that the holders, retorts, scrubbers, etc., etc., are all of the same character; for are they not all necessary adjuncts to a proper and just use of the whole? Let us go further and inquire whether custom in the State of Ohio is in conformity to the legal opinion above advanced. We find that it is. From inquiries directed to all the companies in this State, and responded to by eight-tenths, we find that there is no division or classification of a gas plant into the two dif-

ferent characters of property. It may be laid down as an axiom that in Ohio all of the property of a gas company, except what is plainly detached and personal in nature, is classified as realty. Even where, by the exercise of a choice, an article could be classed as either, it is stamped as realty. The plant, as a whole, goes onto the duplicate as real estate. Money on deposit, coal on hand, loose tools, etc., are, of course, returned and considered as personalty. But in some States, as Tennessee, where the gas company is a corporation or joint stock company, no account is made of either land or personal effects. The stock is taken to represent the value of all the possessions of the company (as I gather from my correspondence from that State), and the stock only is taxed. In some of the other States the owner has no volition whatever at tax time. He has no return to make either as to personalty or realty. This service is done for him by an officer of the State or county. The tax assessor returns the property according to his own idea, and a right of appeal is allowed the property owner. A Court of Tax Appeals sits at certain seasons of the year, at which the aggrieved land owner may appear and show that his property is placed on the duplicate at too high a figure. This is the case in Pennsylvania, and it compares very favorably with the system in vogue in this State. Here we are bound by the action of a land appraiser for 10 years. Our property may deteriorate in value, but the county treasurer hands out bills for taxes in no way reduced on that account.

In a correspondence covering several hundred letters sent to the gas companies in the United States, I find that when it comes to taxation of a gas company's property its possessions are usually "lumped" as real estate—that is, in such States as Ohio, where real property is the basis of values. But in many of the States, especially in the older ones, the capital stock is taken as the basis of the calculation as to the amount of taxes; then the grounds, the buildings thereon, and all the fixtures connected directly therewith, are assessed under the heading of real estate, every one, two, five, or ten years, as the case may be. Such assessments are made by commissioners whose special duty it is to fix such values; then the value of the real property is placed on the duplicate; Its amount is subtracted from the amount and value of the capital stock (not at market price, but par value), and the remainder is taxed as personalty.

The chief recommendation in favor of this system is that it has a very strong and moving tendency to prevent the watering of stock and the unlimited issue of stock certificates, based upon a small actual value. The chief feature which recommends itself is the more or less frequent occurrence of the fixing of values, thus adjusting the valuation more equitably than when the term of fixed valuation is longer. By means of this system an account of natural deterioration can more easily be taken. But, on the other hand, where the business is prosperous and is growing in size each month and year, the owners have no chance to dodge the tax collector behind the smaller valuation of a few years before. Yet, as there is compensation in all things, the prosperous company is paid in a measure for this apparent disadvantage. No matter that its stock is worth 200 per cent. in the open markets of the world; no matter if it does pay very large dividends, it pays only on the par value—the face value of the stock; and the stockholder and dividend drawer, owning a $100 share, which is worth in cold coin just double that amount, or $200, are only taxed on the $100, or its par value.

But the method is disastrous to new or weak companies. Their stock may not even find a bidder at 25 per cent., yet it goes on the duplicate at full face value. This is the method in vogue in New York State, and this law may be the occasion of the great accumulation of wealth by powerful corporations, and the crushing out of such weak rivals as dare to show crest in that great arena of business.

But in many of the States, in which personalty is separated most scrupulously from aught that savors of the realty, it is the manifest advantage of a company to have its mains, etc., taxed as personalty; for then the question of depreciation in value arises each year. We find that in the States where the division is thus made the companies benefit by it by returning them less and less each year. The average deduction is about 3 per cent. yearly on account of natural deterioration, though this varies, of course, greatly in different localities, according to varying climatic conditions, and the chemical qualities of the soil in which the mains are laid.

The voluminous correspondence above referred to is most interesting upon this point, and can be seen by those who so desire. An iron pipe deteriorates more rapidly in value in a wet climate and soil than in a dry one; and were the mains taxed as realty this depreciation could not be taken into account.

There are no fixed rules as to the depreciation on account of wear and tear of machinery or mains in any State. In very few are there any fixed laws for the return of personal property as to value. In some States the assessor is the judge, subject to appeal; in others the owner is the appraiser, and his conscience is his only guide. In Ohio the owner assesses the value of his own goods and chattels. To be sure there is a statute which orders all property to be valued according to its real value in money, but it is a dead letter. It never was nor never will be obeyed. Our neighbor to-day brags that he has a horse for which he has been offered $1,000, and to morrow he lists his roadster at $90. We pay $5,000 for a residence, and we pay taxes on it as if its value in money were $1,300.

In many States where the plant is considered realty in "lump," the meters, nevertheless, are regarded as personal property, and, as such, a certain per cent. is deducted from their valuation each year. No just person could expect the same tax to be paid on a meter year succeeding year. A new meter or a new anything is worth more than an old one. They do deteriorate in value just as an engine or a watch wears out in course of time. They will not last forever, and they grow older and more worn and less valuable year by year. In no single State is there a special law in relation to the taxation of gas companies, except in those above referred to, in which the capital stock only is taxed; and even then they come in under the head of a general statute for the taxation of joint stock companies or corporations.

There is no rule of law in regard to the amount of deterioration on account of usage or age. There is no legislative schedule of depreciation. That is left to the judgment or the conscience of the owner or the assessor, subject to revising boards. We find that it is the custom in all States where the mains, holders and all but the grounds and buildings are considered personalty, to deduct about 5 per cent. annually for depreciation. In our own State, where the whole plant is considered realty (except, of course, detached personal property), we can have no advantage on account of depreciation in value except every ten years, and it depends largely on the liberality of the appraisers that we even then obtain relief.

Gentlemen, I said in the beginning that were I to perform my whole duty in relation to this complex question it would be necessary to evolve order from chaos and harmony from discord. By the brief outlines of this sketch you receive a fair idea of the complexity of this subject, and I trust that, while I know I have not made all things plain, some salient suggestions may have been herein made. The subject of taxation is to us most important. We have seen that no two States have the same system, and I have learned from correspondence that not even two companies in the same State observe identical rules in the return of property for taxation.

The responsibility should be taken by law from the shoulders of the owner of property of fixing its value for purposes of taxation. A legislative schedule should be adopted, by means of which we would be enabled to be fair, not only to ourselves but to the State. There is no doubt but that the value of our property is constantly changing. In this State it is necessary to make oath as to the value of our possessions. Can we properly and in fairness be required to swear positively to what, at best, is a matter of judgment merely?

Gentlemen, I thank you for your attention. My explorations in search of truth and fact in this field have been arduous, to say the least. If I have produced a result, thank *labor* for it; if not, kindly attribute to the difficulties which surround the subject.

Discussion.

The President—As this is a very carefully prepared paper, and a very interesting one, we would like to hear the experience of some other members upon this subject. Possibly some companies don't pay anything.

Mr. Cantine—As you say this is an "experience meeting," permit me to give you a little experience of my own. Last spring our city was incorporated as a city of the second class. I do not know but that it ought to have been the third class, but it was nevertheless incorporated as a city of the second class. A Board of Equalization was appointed, and, having taken on metropolitan airs, it was necessary to have more revenue. I was cited to appear, as the representative of our Company, to show cause why we should not pay more taxes. I made the best statement I could. Of course no one wants to pay more taxes than he can help. I never did it, either for love of the tax gatherer or the city, but only because I had to. (Laughter.) They proposed to add quite largely to the valuation, without assigning any particular reason. They asked how much main we had, and I told them. They estimated the buildings, their size and extent; the size and number of the holders; our electric light plant; so many engines, so many boilers; house of a certain size, 12 or 13 lots, and all that sort of thing was all gone over with and

settled. "Now," they said, "we want you to list the stock." "Oh, no," I said; "I could not do that." "But," they said, "you have to pay on the realty and on the stock, too." Well, that put me in a bad shape—I did not know what kind of argument to use there; but finally a little Yankee ingenuity came to my rescue, and I said, "If a gentleman were to buy a piece of property and were given a waranty deed for it, would he have to pay on the property and on the deed also?" That happening to strike them right, they said he did not, and that I could be excused on the stock.

The President—So much for Yankee ingenuity. Is there anybody else who would like to make some remarks on this subject?

Mr. Thomas—I think Mr. Wilkiemeyer is a trifle in error in his conclusions, more particularly with reference to New York State. As far as the taxation of gas property in that State is concerned, the gas companies have nothing at all to do with it. Assessors are appointed. They value what they term real property, and the personal property is the balance of the capital; and their object is to make that real property just as small as possible, and for this reason: In all assessments for real estate in New York the assessment is based upon the valuation of 70 cents on the dollar. You can readily see how this would be. Take a company, for instance, with $1,000,000 capital; if it had $500,000 in real estate and $500,000 in personalty, the real estate would then be valued at $350,000, or 70 per cent.; so that when you pay on your real estate and personalty you would be paying on $850,000, instead of $1,000,000; then it would be the object of a company there to get as much as possible into real estate, because it would be assessed as stated above. Then, again, Mr. Wilkiemeyer is wrong as to the assessment of stock. Suppose the value of stock there is 25 cents on the dollar, because the company pays no dividends. In that case the tax paid is at the rate of 25 cents on the dollar. On the other hand, if the stock is at 200, they tax you up to that 200, if they see proper. The mains, benches, and other appliances about the gas works are not counted in as real estate, but simply the buildings and land.

Mr. Cantine—I was told by a very eminent legal light in this State that the mains of the gas company were not taxable, and that it had been so decided by the State Supreme Court—that these were not property in any sense of the term, hence that all the pipes and mains outside of the gas works were exempt from taxation.

The President—We have a Committee on Legislation. I do not know whether that would come within their duties or not. What is the wish of the Association in that regard?

The Secretary—I should think it would.

A Member—It would be a good place for them to begin.

Mr. Cantine—I do not wish to occupy the attention of this Association a moment longer than is necessary, but the gentleman I referred to gave as a reason for this decision that the pipes or mains outside of the works were not of any practical use to anybody except for a specific purpose; it was not property that you could use for anything else. It was laid beyond the reach of everybody; that it was continuously deteriorating; that it was done for the benefit and use of the public, and was neither personalty nor realty. We all agree that mains are continually deteriorating. I never saw any mains removed that were of very much value; they are hardly fit for old iron.

Mr. Wilkiemeyer—Did I understand you to say that a decision had been given to that effect?

Mr. Cantine—Yes, sir; so I was informed. I did not say I knew it to be so; I simply stated that this legal gentlemen told me such was the case.

Mr. Wilkiemeyer—I have given this subject, especially in this State, a very thorough study. I am not a lawyer, but I think the lawyer that gave that advice is certainly mistaken. This question has never come up in the courts. It may, however—well, I simply stand by the assertion which I made, that it has never come before any court. There are only four cases, I think, where the tax question has been passed upon by any court. The first, I think, was a case in which Proctor & Gamble, of Cincinnati, were parties. That was simply a listing of personal property. The assessor claimed that all stock they had on hand unworked should be listed for taxation; they claimed not, and it was decided in favor of the company. Then there was a decision in a brewery case from Cincinnati—I don't remember just the style of the case; and I think there were two other cases; possibly only one other. These are the only ones in all readings that I have come across. I may have missed them, but I think not.

Mr. McDonald—I noticed an error in what Mr. Thomas spoke of, and thought I might make it a little clearer to the members here in regard to taxation in the State of New York, as I am somewhat familiar with it. I would say that Mr. Thomas said the real estate is taxed and then the stock is taxed, and the value is put on the stock by the secretary or treasurer of the company, and he swears to the value of it. If the value of the stock is put at par, he pays 1½ mills on a dollar, until it pays 6 per cent. dividend; then he pays an increased tax, if it pays a larger dividend than 6 per cent. It is really a dividend tax, but they tax the stock at 1½ mills per dollar until it reaches 6 per cent., and then beyond that they increase it. Isn't that right, Mr. Thomas?

Mr. Thomas—Mr. McDonald is referring to a matter of State taxation, which is entirely outside of the matter under discussion. The capital stock of a corporation is taxed as he states and in the manner he states, but that is entirely outside of the paper that Mr. Wilkiemeyer has read. They are two separate taxes. I was trying to show why it was to the interest of a gas company to get as much of its property under the head of real estate as possible. For instance, if a corporation having a million dollars of capital got its whole valuation into real estate, with the deduction that is made, it being assessed at 70 per cent. of the valuation in New York, it would only be paying tax on $700,000. A company I was connected with put its earnings into improvements for the benefit of the plant, and after some years, to recoup the stockholders, issued scrip and gave it to the stockholders. It was considered that the scrip could not be taxed, but it was taxed, and the company was called on to pay on a million dollars of stock and a million dollars of scrip. The company appealed to the courts. It was taken into the local courts and decided against the company. Finally it reached the Court of Appeals, and that court sustained the lower court, and the company had no way but to pay the tax.

Mr. Wilkiemeyer—I said the valuation of property in New York was taken from the capital stock. As I understand, Mr. Thomas says, in the particular case cited, that the stock and the scrip were taxed. Of course, in the conclusions I came to I have gathered or reasoned from correspondence I have received from these different cities of the States. I think the letter I received from New York said that mains were taxed to the extent of $6,000 per mile. Now, the writer did not say who valued it at that, but it was valued at that by some person. He gave me to understand that.

Mr. Thomas—I do not know of a case of that kind, Mr. Wilkiemeyer, with the exception of one, and in that case, in getting the grant from the city, the company agreed to pay a tax upon every mile of main laid for the privilege of putting them into the ground. Otherwise the system is precisely as I have stated. It is the object of companies to value their real estate as high as they can, simply owing to the way in which the tax is levied.

Mr. Lindsley—Mr. President, I move you, sir, that the question, as raised by Mr. Cantine, be referred to the Legislative Committee recently appointed, with instructions to investigate and report at our next meeting. It seems like a question which should be submitted to them for their consideration.

The President—Wouldn't it be a little late to report at our next meeting? Isn't there a new valuation of property to be made in 1890? The mischief will all be done by that time. It would be better to take some action a little earlier than that. Could not the committee be empowered to endeavor to bring about some uniformity in returning property for taxation?

Mr. Lindsley—Mr. Warmington has just suggested that the fixing of the valuation for taxation in 1890 will not occur until after our next meeting. It would require some preliminary work to bring this thing about.

Mr. Wilkiemeyer—Since writing this paper I found that last Wednesday a bill, which had been introduced into the Legislature of this State, was passed, I think, empowering the body to schedule all the stock companies under one certain heading. Now, the method that they will adopt is not agreed upon, but I understand that the bill was passed last Wednesday. Mr. Monks, of Boston, has kindly requested me to offer to the Secretary of the Association "The Fourth Annual Report of the Gas Commissioners of Massachusetts," in which the taxation in that State, of the different companies, is very clearly defined and set forth, and which is certainly very interesting.

A motion was then passed referring the subject to the Legislative Committee, with instructions to investigate and report at the next annual meeting.

Mr. Printz—I think this is one of the ablest papers we have ever had read before us. This is the second paper we have heard from him on legal phases of the gas business. When called upon before he said he thought he was not able to prepare a paper; but he gave us a splendid one, and now he has given us another. I don't think I ever heard a better one read to the Association. I therefore move that a vote of thanks be tendered to Mr. Wilkiemeyer for this paper. [Adopted.]

The President—I will now call upon Mr. Edward Lindsley, of Cleveland, for his paper upon

FUEL GAS AND INCANDESCENT GAS LIGHTING.

The reason for reading this paper at the present time, and out of its regular order, is because Mr. Lindsley is liable to be called away at any moment, and he would prefer to read his own paper.

Mr. Lindsley then read his paper, as follows:

The President and Gentlemen:

The thought of preparing a paper upon the subjects of Fuel Gas and Incandescent Gas Lighting recalls the introductory remarks of Brown, the mind reader, at a recent appearance before a Cleveland audience. Before introducing his experiments he explained it was an essential requisite to success that the subject whose mind he should read be thoroughly in harmony with himself—that if arrayed in mental opposition or antagonism the attempt would most likely result in failure. And again, if there were no mind to read—manifestly, results could not follow. I trust, however, it will not be inferred from this reference that an attempt is to be made to prove the non-existence of these greatly to be desired twin commercial factors. That they have neither an existence, nor promise of existence, one certainly would not be warranted in saying, and the desire for fuel gas is undoubtedly as old as the knowledge of how to make a combustible commodity in gaseous form. Almost from the first, illuminating gas was *somewhat* used for heating purposes; and, notwithstanding its cost as compared with solid fuel, the use of it grew apace, especially in these latter years, which fact is abundantly attested by increased consumption due to the use of gas stoves for domestic cooking and heating, also in various manufacturing operations. Latterly, stimulated by natural desire, arising from a common sense view of the seeming possibilities of the situation, and still further, and more recently, by the use in certain favored localities of that prince of fuels, natural gas, there seems to have sprung up a new and stronger demand than ever for a distinctively fuel gas; and with the demand an abiding faith that the problem will in some way be solved. And there seems to be an expectation, and perhaps not without reason, that the existing gas man shall somehow prove the bright pupil in the class.

Nearly a year and one-half ago, one of our brightest lights (ex-President McMillin), read a paper entitled fuel gas before the American Gas Light Association, at New York. It is not too much to say many regarded it the expression of advanced ideas, and the precursor of a new era in gas matters. At the close of our last meeting, several members, the writer among them, went from Sandusky to Pittsburg to witness the working of an experimental plant, on a generous scale, erected by the Fuel Gas and Electric Engineering Company, for the sole purpose of developing a process for the manufacture of fuel gas. That plant, or the greater part of it, is now for sale, and, to appearances, the experiments have resulted in disappointment. Many years ago plants were installed in some Eastern cities and villages to furnish uncarbureted water gas for fuel purposes. These have not been followed by similar installations elsewhere, in numbers or magnitude to warrant a belief that they thoroughly fulfill the requirements of a perfect gaseous fuel. At frequent intervals along the modern highway of time appear new, improved, and, may I say, hitherto unknown processes of carbureting air; capable of producing (according to their sanguine inventors) from a barrel of crude Lima, or small quantity of low gravity naphtha, any desired number of hundred thousand cubic feet of elegant material suitable for illuminating or fuel purposes.

Even ladies who go into ecstacies over a "love of a bonnet," abandon their long-cherished and seemingly more natural pursuits of millinery and dressmaking, to dabble in the mysteries and possibilities of petroleum. Again, more seriously, the recent utterances of an eminently high authority, would indicate a confident expectation of such improved conditions in the manufacture and distribution of coal gas as should give it the same pre-eminent domain for fuel purposes that it now holds as an artificial illuminant. A pamphlet came into my hands recently, entitled "A Report," upon the Dickson Process for the manufacture of cyanides and ammonia from the nitrogen of the air, in which is claimed the ability to produce over 100,000 cubic feet of gas for every ton of coal consumed in every department in the manufacture of gas. And, after enumerating the many advantages of the process, goes on to say, that they sink relatively to insignificance when viewed in connection with the fact that, whatever may be the yield of gas in cubic feet from a ton of coal, and its commercial value, it is notwithstanding the minor product of the process, the major one being cyanogen, or some compound thereof, from which ammonia or other chemicals into which cyanogen enters, s afterwards manufactured—the gas commercially occupying the same relative position by the process indicated that the tar does in the coal gas manufacturing process—if there is a demand for it at a price covering the cost of distribution, it is worth storing for sale; otherwise, not. Unfortunately, no description of the apparatus or its working is given; the inventor seeming to rely on an experience of 33 years in erecting and running large gas works as a sufficiently potent guarantee that he can manufacture gas, and supply the same to consumers at a price which will successfully compete with fuel; by which, I presume, he means solid fuel. While in a desultory mood, perhaps I may be indulged in another reference to Mr. McMillin's paper, already referred to. In his concluding remarks these words occur: "The demand for fuel gas like the demand for electric light, has come to stay. It will not down; scientific investigators as well as the public insist that there ought to be, and must be, a change in the mode of domestic and industrial heating. Our present systems are not in keeping with the progress of the Nineteenth Century." To which it is assumed we can all lend a ready assent. These references and citations, of course, have a certain significance, and might be continued almost indefinitely, but are not introduced because they prove the existence or non-existence, the possibility or impossibility, of fuel gas. The term is a broad one, and its meaning may be fulfilled to different minds by different processes. To my own it is a long way from being realized by any thus far introduced to public notice. It is not proposed here to discuss directly the merits or demerits of any process already advanced or suggested, or attempt to bridge the chasm between present conditions and fuel gas as an accomplished fact. When its history shall be written, each factor in the solution of the problem will doubtless be assigned its true value. For the present let us assume an existing necessity, and inquire, What are some of the conditions to be met? Cheapness, for one; and by that I do not mean low cost of a given volume, but economy in the production of heat units. While immunity from the filth and drudgery attending the use of solid fuel is something to be desired, gaseous fuel will nevertheless stand at some disadvantage, if its use be attended with much increased expense.

To be thoroughly successful, it should be cheap enough to be the fuel of the masses, and the volume should be almost wholly combustible matter, that the expense of distribution be not unduly increased. Safety, also, is a consideration of even more importance than economy. To this end there should be a permanent and unmistakable order, and the specific gravity should be materially less than air. Fixed permanence should characterize the product that neither friction nor condensation entail loss and attendant inconvenience, no matter how extended the lines of distribution. Finally, invest it with light-producing power, and the measure of excellence will be so nearly complete that one word, *perfection*, might be used describing it. Unfortunately, exact comparative data, as between solid fuel and existing gaseous forms that have been used to some extent as fuel, are very meager. And, again, it is doubtful if the devices for using gaseous fuel are relatively as well adapted to the intended uses as those designed for solid fuel. Indeed, in practice, the latter, with some trifling modifications, are made to serve in utilizing gaseous fuel; and I think it fair to presume, somewhat to its disadvantage, so that, in the ultimate solution of the problem, devices for using will doubtless figure as important factors. Meantime, whatever present conclusions we arrive at must obtain from conditions as we find them. Among gaseous forms with which we are more or less familiar as heating agents, may be mentioned natural gas, coal gas, water gas (carbureted and uncarbureted), carbureted air and producer gas. The first named, were it universally, as it is in certain favored localities, generously diffused, would with the aid of a suitable incandescent fulfill every requirement of perfect excellence.

In the absence of such distribution, we seek an artifical substitute. The efforts to utilize the now very cheap petroleum with common air (sometimes combined with a small percentage of water gas) as a vehicle or diluent, have been attended with more or less success; and I am quite prepared to believe that for illuminating purposes, under certain favorable conditions (short lines of distribution, for instance), there may be a future of fair possibilities in store for it. But we are considering fuel gas; and in view of the large amount of non-combustible to be distributed in this combination, I should scarcely expect flattering results over any extended lines of distribution for heating purposes.

As previously intimated, when we seek to compare values we are confronted in practice by a measure of uncertainty. Calculating the weight of constituents to ultimate determinations, the scientist accurately proves a certain possible outcome in heat units; but mechanical or other difficulties often modify the results. For our present purpose, then, let us seek conclusions from such practical data as may be at our command. Coal, in anthracite or bituminous form, is perhaps more extensively

used for heating purposes than any other one substance we can mention. It would perhaps be difficult to determine its average universal cost, but it will suffice if we approximate an average for a given point. Take Cleveland, for instance.

For the month of March, 1888, the average cost per net ton to the consumer, as shown by the retail books of the leading house there, was $3.60—a much smaller concern, and one whose anthracite trade is proportionately much less, shows, for February, 1889, an average of $3.40; so let us assume $3.50 as a fair average. Long distance distribution, and observed indications over shorter lines that the supply of natural gas is not inexhaustible, is beginning to open the understanding of the companies furnishing it to the fact that the rule of thumb, or contract system of furnishing the product, "is not the fairest, safest, or most economical method of buying or selling."

In the early days of natural gas the cost of the coal previously used by the would-be consumer determined the amount to be paid. And when the gas was turned on, the size of the house and adjacent grounds regulated the amount of gas used. Necessarily the quantity was an indefinite one, and economy came to be a matter of some importance. So we find the much execrated and despised meter beginning to be recognized in distributing natural gas, and are able to determine more nearly the amount of gas required in domestic and other practice to equal the work of a ton of coal.

Engineer McElroy, of the Pittsburgh Gas Company, has kindly furnished data, obtained from careful experiments, which showed that 21,000 cu. ft. of natural gas evaporated as much water as 2,000 lbs. of coal; from other reliable sources I get evidence obtained in practice that from 7.5 to 11.1 cu. ft. of gas equal 1 lb. of Pittsburgh coal. The *Scientific American Supplement* (No. 520, Dec. 19, 1885) gives description of test and records the judgment of the committee of engineers, Society of Western Penn., which was that 1 lb. of coal has the fuel value of 7.5 cu. ft. of natural gas—Murraysville or Lyons Run, I think. Therefore, 15,000 cu. ft. of gas would have a fuel value of 2,000 lbs. of coal. Other data from the very best sources of observation have been furnished, but this last is the best showing for gas that I have obtained, and will be used in coming to further conclusions.

The relative calorific values, by volume, of various gases as given by Mr. McMillin, using natural gas as the unit, are as follows:

	By Volume.
Natural gas	1,000
Coal gas	666
Water gas	292
Producer gas	130

The water gas rated being that obtained by the decomposition of steam in the presence of incandescent carbon, and uncarbureted. The volumes required to develop a given heat energy would therefore be, relatively, very nearly as follows:

	Volume.
Natural gas	1
Coal "	1.5
Water "	3.42
Producer "	7.7

Now, if we assume 15,000 feet of natural gas to be the equal of 1 ton of coal in developing heat energy, the relative quantity required of each would be as follows:

Natural gas	15,000 cu. ft.
Coal "	22,500 "
Water "	51,300 "
Producer "	115,500 "

And assuming $3.50 as the value of a ton of coal, delivered (the coal was delivered to the consumer in the cases cited), dividing this amount by the above equivalents, we have:

For natural gas	$23\frac{2}{16}$ cents per thousand.
For coal gas	$15\frac{5}{16}$ " " "
For water gas	$6\frac{8}{16}$ " " "
For producer gas	3 " " "

Carbureted air has been omitted in the comparison for want of data to base it on; but it is believed the large amount of non-combustible it must necessarily carry would be fatal to its use, if for no other reason than the heavy cost of distribution. It is said that by an exhaustive utilization of bye-products coal gas has been stored in the holder at nil, the bye products meeting all the expense of manufacture. Could coal gas be everywhere manufactured under such conditions it would be a cheap fuel as well as an illuminant; but the question immediately confronts us, "What would be the financial effect upon residuals were such conditions generally realized?" Must we consider that the show for manufactured fuel gas is not a flattering one? Surely, the question is one of difficulty, and the best of us should approach it with becoming modesty. I presume there is not a member present but has pondered it carefully; and that all will leniently regard an inclination to rest the case right here. But that does not seem quite the thing to do, and perhaps you will indulge me in the presentation of some thoughts that seem to me not entirely visionary. While not wishing to wade in the deep water of science, it nevertheless teaches certain things that are regarded as fundamental, cognizance of which may serve as a lever to move thought, as the marine engineer would say, "over the dead center." Therefore, may I cite briefly from her teachings. Matter is regarded as imperishable and may be transformed or made to assume new forms, but never destroyed. Energy is as indestructible as matter. Heat is not matter, but a form of energy, and we are able, in practice, to exchange units of matter or energy in one form for those of another; and the return of an equivalent for useful effect is more or less perfectly realized as we observe nature's law in conducting the exchange. To my mind, no matter what process be adopted, success in making and distributing gas demands such observance at every step, and in the highest possible degree. To this end the process in every department should be continuous, if possible, rather than intermittent, and conducted from beginning to end in closed vessels.

The proper conditions for perfect combustion are so well understood now that it would seem there should be no difficulty in producing the means. In the absence of personal experience, I would think the main defect in regenerative furnaces might be removed by simple but positive means of governing both the primary and secondary air supply; that the heat when generated may be more perfectly utilized than obtains in present practice, I think, goes without saying. The vicious performance of the uptake or chimney can be, and should be, materially curtailed. Conduction and conversion should be utilized in saving heat to the last possible unit; and not, as is now too often and needlessly the case, in wasting it. But a truce to generalities and details as well. I have not perfected a system and apparatus to carry it into effect. If such were the case probably I would have patented it and brought the specifications and drawings with me; but something more tangible than the foregoing will not be out of place here; and what follows is submitted with the hope that some bright mind may gather a cue that shall lead to the development of practical results beneficial to our industry.

Suppose, then, that we take bituminous coal for material (I am a coal man), and charge it, first in retorts similar to those in present use. Charge the coal at the rear end, and, as now, take off the gas and remove the coke at the front. To equal a 4-hour charge of 300 lbs., introduce 75 lbs. each hour, having previously withdrawn the equivalent coke, without exposure to the atmosphere, into another chamber, heated by external firing, in which the decomposition of steam is continuously and steadily effected. The resulting gases may be carried from the generating apparatus and treated together in the further operations, until stored in the holder. The product at this point would be almost wholly combustible, odorous gas, of low illuminating power, but good heating qualities, and with the aid of a suitable incandescent would furnish an excellent light. Transferring the coke from retorts to generator and charging the coal, cannot be expected to become an automatic process; but the manual labor required may be only such as will be necessary to direct the action of steam mechanism. Indeed, if inclined retorts be a success, the whole operation becomes largely a matter of gravity. Some of the advantages expected to be gained would be: In the coal process, immunity from the extremes of temperature within the retort that now obtain; slighter variations of temperature in the evolved product—all the products of distillation being brought gradually to the highest required temperature, and having the retort at practically the same temperature; the heat which remains in the coke, after the coal gas is driven off, is saved for further useful effect, and all accomplished at a great reduction in cost for manual labor. In the water gas process, the manifest loss attending the use of the intermittent air blast is avoided, as well as that which would seem to one not practically acquainted with the present process likely to occur by reason of over use of the steam jet. But it would be tedious to consider at this time every question that might arise in this connection, and furnish an answer. Possibly an opinion in due form, as to the practical feasibility of the scheme suggested, might be considered in order here. If so, the difficulties as I see them are almost purely mechanical, and require for their removal money, brains and patience.

I suppose the title of this paper was invented by our Secretary—certainly it did not originate with myself. Deference to it would dictate that the subject of incandescent gas lighting be more particularly recognized before closing. Depending upon the characteristics of fuel gas

that shall finally find favor with the public, it may become a matter of the highest importance, notwithstanding excellent authority might be quoted in support of the idea of two sets of mains, one for fuel and another for illuminating gas—I think the average gas man invested his first ideal of a product, distinctively adapted to fuel purposes, with a lack of illuminating qualities, and almost involuntarily sought to supply the defect by some sort of incandescent appliance.

My own first thought was to suspend a platinum coil in the non-luminous jet. When calling at the Lowe water gas works, in Yonkers, N. Y., some years ago, I suggested the idea to the chemist there, who immediately opened a drawer and produced such a coil, with the inquiry if it was like the thing in my mind. I naturally inquired what was the matter with it, and received for a reply, "Too expensive;" and not so much because of first cost as for the necessity of frequent renewals. Since then (8 or 10 years ago) inventive genius has not been idle, but, I suspect, the renewals would cut a serious figure in the use of any device yet invented. It would seem as though anything of the sort must necessarily be frail in structure, and short lived in the service required. Still, if cheap enough and convenient of application, incandescent gas lighting would doubtless come to the front with the advent of a distinctively fuel gas, destitute of illuminating qualities. My personal acquaintance with devices of this sort and their merits in action is confined to two forms—viz., the Fahnehjelm comb and the Welsbach. The former, when new and under the influence of an uncarbureted water gas jet, gives a very pleasing effect, which, however, is seriously diminished under the influence of a very slightly enriched gas. I have seen the Welsbach using coal gas, carbureted and uncarbureted water gas, and natural gas; and while it may not be a matter of indifference which is used, the light is pleasing and effective with all. Furthermore, the illuminating effect from a given volume of illuminating gas is greatly enhanced; which fact will to some extent offset the cost of renewals. But, with Lima crude at 54 cents per barrel, why not carburet the fuel gas, and educate the public to appreciate quality as well as quantity?

Discussion.

The President—We are now ready to hear discussion upon Mr. Lindsley's very valuable paper.

Mr. Coverdale—I move that a vote of thanks be tendered Mr. Lindsley for this paper. [Adopted.]

The President—As we have another paper on pretty much the same subject, probably it would facilitate matters if we wait until that paper is read and then discuss both at once. The next paper upon the programme is

CARBURETED WATER GAS, AND ITS ADVANTAGES OVER COAL GAS,

by Mr. Charles R. Faben, Jr., of Toledo, Ohio.

Mr. Faben then read the following paper:

Only a short time ago, comparatively speaking, were a person closely identified with coal gas interests to speak in favor of the manufacture and supply of carbureted water gas his act would be regarded by his former companions in the gas business as little short of treasonable. To illustrate to what extent these conditions have changed, I cannot do better than to quote a leading editorial contained in the issue of Oct. 16, 1888, of the London *Journal of Gas Lighting*—a journal the quality of whose editorials I need not declare. It is as follows:

"*Water Gas Auxiliary to Coal Gas.*—In commenting last week upon the proceedings at the meeting of the Commercial Gas Company we referred briefly to the remarks made by Mr. H. E. Jones respecting the advantages of some of the water gas processes which he found in use in the United States, regarded from the point of view of an English gas manager. The mention of this matter recalls the position taken up some two or three years ago by the *Journal* with respect to a cognate subject—the disposal of coke in the form of fuel gas. At that time there was a glut of this residual, all the gas works of the country being choked with unsalable stocks; and while the consumption of gas was everywhere increasing there did not appear to be any outlet for the additional weight of coke that was being thrown upon the market every year. It began to look as if the point of saturation had been attained in respect of coke, while the absorption of gas was still progressive, and in many places the increase of gas consumption, ordinarily hailed with satisfaction by gas companies, was positively dreaded by engineers and managers responsible for disposing of the superfluous coke. We have reason to know that in several instances gas managers had already commenced making inquiries as to the possibility of converting their coke into fuel gas for consumption in the immediate vicinity of their works, when the tide turned, and the stocks of coke began to shrink as unaccountably and irresistibly as they had accumulated. When Mr. Jones talks about the possibility of water gas processes being useful auxiliaries in British gas works, therefore, he is not speaking of something that has never been thought of before, although the office which he thinks these might fill is different from that already discussed. Water or generator gas processes, as means of getting rid of a surplus stock of coke, having dropped out of sight together with the condition with which they were evoked to deal, we are left free to discuss them again with reference to the particular application referred to by Mr. Jones.

"It is unnecessary to disclaim at the outset any intention of recommending water gas as a substitute for coal gas in any country, much less in the natural land of coal gas. Our position with regard to this matter is the same as ever. Water gas cannot be made here so economically as common coal gas, even at the present low price of liquid hydrocarbons suitable for carbureting. At the same time it is probable that in most places throughout the United Kingdom it could be made as cheaply as the cannel gas, which it would equal in illuminating power. In the United States, as is well known, coal and water gas have divided gas engineers into hostile factions, whereof one could not say anything good of the other. The coal gas men arrogated to themselves the name and position of gas engineers, and would not allow to their enemies any other titles than those of schemers, pirates, and similar terms of opprobrium. The scorn was returned with interest; the water gas men having a special press 'organ' which heaped on the coal gas party all the flowers of American journalistic satire. The coal gas people, as the first in the field, naturally regarded the others as interlopers; and the peculiar nature of American institutions favored the growth of competition between the two systems of gas supply, until their rivalry grew to such a height as to be recognizable on all sides as an unmitigated nuisance.

"There is not a coal gas company of any note in the United States that has not been driven to defend itself, sometimes by serpentine methods, against water gas speculators; and the result of this chronic state of 'private war' in the country is that both systems are discredited. The coal gas companies, while, on the whole, the more stable and respectable of the two orders, have kept up the selling prices of gas in order to make their capital secure in the shortest possible time, and also to provide themselves with large fighting funds against the inevitable day of conflict. The water gas systems, ingenious and valuable as some of them are intrinsically, have only too often been made to act as blinds to speculative trickery which the most complaisant admirer of native smartness has found it difficult to condone. Financial considerations have accordingly so confused the issue, that until very lately it was practically impossible to say positively what either coal or water gas could and could not do for the lighting of American towns. It was as difficult to glean trustworthy data respecting this, the great gas question of the United States, as to pick up satisfactory political information from the opposing newspapers of the country. One party simply painted itself white, and the other black; and there was the end of it. Latterly, however, gas matters have been gradually settling down. The coal and water gas men have begun to talk sensibly among themselves; and there has been a good deal of exchanging of interests between them. In some places the water gas people have bought out the coal gas interest; while in others the reverse process has been effected. In very many instances all feeling and prejudice on both sides have been obliterated, and the only remaining interest has been to do a paying business by selling the most profitable commodity. In this way both water and coal gas have been brought to their bearings in different localities.

"Roundly speaking, the American choice between water and coal gas when untrammelled by external influences, is determinable by the same kind of considerations that have effected the existing difference between English and Scotch gas. Water gas is indicated, as a physician would say, by certain considerations, mainly geographical. There may be localities so awkwardly situated with respect to the gas coal fields, that for them it is a case of water gas or nothing. Such considerations cannot be ignored; but we are free to maintain that dwellers in such places are to be pitied. We are not going to argue the old question of whether lighting gas containing more than 10 or 15 per cent. of carbonic oxide should be permitted by law to be sold. There is a great deal to be said for and against the employment of a useful but poisonous gas, supposing that nothing better can be obtained at a reasonable figure. At the same time we maintain that the distribution throughout a town of illuminating gas containing upwards of 40 per cent. of carbonic oxide is a course which, however recommended by purely commercial considerations, is open to the gravest objections of another kind, which need not be specified in detail. Fortunately, the cost of the article is a sufficient guarantee that it will not be manufactured for sale in the United Kingdom so long as existing conditions prevail.

"Poisonous and costly as it is in its normal state, however, it is easily imaginable that water gas has its special attractions for the gas engineer. To begin with, its production is almost ideal gasification. No handling of the raw material—simple tipping into a hopper; and the production of gas almost illimitable at will. On a corner, 14 or 15 feet square, of a retort house, will stand a gas generator capable at any time, upon a few hours' notice, of yielding 30-candle gas at the rate of 3 million cubic feet per day. Many of the gas companies of the States that have acquired water gas processes, use them wholly for times of emergency. The existence of a spare generator of this kind in the works is worth to the manager an additional holder and half a dozen settings of retorts. The fuel and gas making material is in the coke yard; and the carbureting oil can be stored in a tank until it is wanted. In a dozen United States cities the gas consumers never know when they are burning plain coal gas, or the same with a strong dash of water gas. If water gas is ever naturalized in British gas works, it will be in this way, as an auxiliary to the ordinary process of manufacture; and the advantages of such a resource must be ascertained, in every proposed case, with regard to local conditions. It is impossible to lay down a hard and fast rule on the subject, to the effect that water gas either can or cannot be profitably used in a British gas works. It must depend upon considerations which will require to be stated and satisfied in every individual case. What might answer the purpose in London need not necessarily be convenient for Manchester; nor need Birmingham lead Edinburgh, or Glasgow, Liverpool. All that has to be insisted upon for the present is that here is a matter that should not be lost sight of."

From the editorial quoted we may learn just how our operations here in this country are regarded by the coal gas people of England, and further note the fact that, were the proper conditions forced upon them, they would likely engage in the manufacture of carbureted water gas, at first, perhaps, as an auxiliary to coal gas; yet I feel safe to assert that if once thoroughly tried and tested they would not readily abandon its use.

The manufacture and use of water gas have advantages over coal gas to both producer and consumer. To produce large quantities of coal gas requires extensive apparatus for its production, and the same is accomplished slowly; and to properly provide for the irregular consumption, on account of particularly dark and bright weather, additional labor and apparatus, no matter in what form, must be held in readiness for service at very short notice.

To produce a correspondingly large quantity of water gas does not require any such extensive and expensive conditions.

To produce an excessive quantity of gas, one simply needs to run his apparatus a few hours longer, and should the reverse be required, the apparatus can be put on natural draft, and no waste or damage can result. The purely extra laborers that are held in sort of reserve about a moderate sized coal gas works, would be ample and sufficient for all labor required to produce, with a water gas apparatus, a like amount of gas. To produce a quantity of coal gas requires some one to do some very hard work, and also requires close attention on the part of the manager to secure uniformly good results. To produce a like amount of water gas does not require any one to do much heavy work; and uniformly good results are easily obtained, when the generating apparatus is operated by any careful and moderately intelligent person.

Carbureted water gas, as ordinarily made, is, for general illuminating purposes, better than ordinary coal gas. In these times of sharp competition between lighting companies, it behooves gas companies, as suppliers of light, to offer to the public an article that not only is good, but an article that looks good; and a gas company which sells a better light for the same money has in fact made as great a reduction to its consumers as has some other gas company which has reduced the selling price proportionately, and allowed the illuminating quality of its gas to remain unchanged.

Some years ago a 12-candle power gas was considered a merchantable article; but as better apparatus and other improvements were brought forward coal gas companies furnished a better article, and about 16-candle power was the common claim. Then came the water gas, and made a still higher candle power an easy possibility. This may not be just in the order as they occurred, but simply as the subject presents itself to me.

Some of the more thrifty and energetic gas companies, in their efforts to make a better quality of light, resorted to the use of a higher percentage of cannel coal, and others to some one of the many types of "oil gas apparatus" for enriching coal gas; and of course it all resulted in a general improvement in the illuminating quality of the gas furnished; but either of these methods had its drawbacks.

The hydrocarbons from cannel coal being heavy, the combustion of the gas resulted in a heavy thick flame, in color resembling that of an orange; while the illuminating power was high, it did not prove near as satisfactory to consumers as did the color resulting from the combustion of coal gas enriched with petroleum naphthas. The hydrocarbons from the naphtha being very light, its combustion resulted in a thin flame and of a color more closely resembling that of a lemon.

The enriching of coal gas with naphtha was not at all times satisfactory, and for several reasons. Among these I may cite one or more of the most prominent objections. In producing the gas it was necessary to use a fractionated naphtha—in other words, an oil made up of hydrocarbons having a narrow range of densities—so as to insure producing gas from nearly all of it in the first operation. If a crude article were used one would be quite apt to make soot out of the light portion, and tar from the heavy portion, and only secure gas from the heart of the oil. This would prove annoying and expensive.

In using naphtha to enrich coal gas it is necessary that it be furnished heat enough to convert the naphtha into gas, not simply vaporize it, and in this form pass it through the works to the holders and street mains. On account of the comparatively high percentage of light carbureted hydrogen present in coal gas, in combustion the flame temperature is not high enough to admit of passing naphtha vapors through it without great liability of producing smoke. If the naphtha were gasified, not simply vaporized, there would be less liability of smoke resulting at the point of combustion. In passing coal gas, charged with simply vaporized naphtha, through the works, holders and street mains, if, from temperature or mechanical friction, or from both of the conditions combined, the naphtha vapors be deposited, such action would result in impoverishing the gas, and the whole gas would be of a lower illuminating power than if no naphtha were used, as many of the valuable illuminants from the coal would be dissolved out of the gas and deposited with the naphtha.

The more modern water gas apparatuses, and the gas produced by them, have much to commend their adoption when compared to the ordinary coal gas plant, and plain coal gas.

It is possible to make carbureted water gas of a much higher illuminating power, and less liability to smoke, than a plain coal gas of a materially lower illuminating power.

The peculiar construction of existing water gas apparatus is such as to present many of the desirable features necessary for the economic gasification of the hydrocarbon oils, and the absolute necessity of using a fractionated naphtha is removed, and in its stead crude oil, made up of a wide range of densities, may be used, insuring to the user a great measure of safety and a high order of economy.

This brings us to another point. When crude oil is used instead of a fractionated naphtha for carbureting gas, a change in the color of the light will result, in much the same manner as referred to in the use of a cannel coal for carbureting coal gas. This does not manifest itself to a marked degree when used for carbureting a water gas, and for the reason that in the combustion of water gas a higher flame temperature is attained than is possible with ordinary coal gas.

We can imagine an ideal illuminating gas made of pure hydrogen, together with the necessary amount of mechanically suspended vapor of carbon. The hydrogen would form the vehicle for carrying and distributing the vapor carbon, and, in combustion, the hydrogen would make the heat zone, and the mechanically suspended vapor carbon, in passing through this heated zone, would be rendered highly incandescent, the result being a beautiful gas light. Commercially, it is not practicable to make a gas constituted as the above described, but with carbureted water gas we can approach conditions of that nature much closer than is possible with plain coal gas.

A not careful comparison of the analysis of ordinary plain coal gas and ordinary carbureted water gas would clearly determine this fact, not to mention the possibilities with a carbureted water gas.

It is not within the province of this paper to draw a comparison between the cost of coal gas and carbureted water gas.

Each of you gentlemen who are making coal gas know exactly what it costs you to make 1,000 cu. ft. of it, and you know the illuminating power of the gas you are furnishing; yet I can assure you that with some of the existing water gas processes you will have no difficulty in delivering into your holders 1,000 cu. ft. of 20-candle power carbureted water gas by the expenditure of, say, 45 lbs. of good coke and 5 galls. of crude oil, as representing the raw material required for its production.

This paper is presented for your consideration without further suggestions than the following:

If you are disposed to give your patrons a higher candle power gas than formerly, you can serve them best by adopting some of the existing types of water gas apparatus. If you are viewing the matter from a

purely commercial standpoint, knowing the exact conditions of the lighting interests in your own district, and also the cost of the raw material required to make carbureted water gas, you must judge for yourselves how you can best serve the interests of the company that you represent, and, at the same time, the true interests of your consumers, who are your only support.

Discussion.

The President—What shall we do with this paper, gentlemen? It is a very valuable paper, and we ought to have an hour's discussion on it if necessary.

Mr. Cantine—Mr. President, I move a vote of thanks be tendered to Mr. Faben for the paper just read. [Adopted.]

Mr. Somerville—If discussion is in order now I would like to ask: Mr. Faben if he has found that water gas carries as well as coal gas? Does it not, say, beginning about one-quarter of a mile from the works, deteriorate very much faster in quality than coal gas? It has been my experience that it does. It may be possible that I do not use it the same way he does, but I have observed time and again that, especially on a cold day, it is constantly diminishing in power. Now, I do not know whether it is my fault or whether it is the fault of the gas. I should like to hear if Mr. Faben has experienced the same thing.

Mr. Faben—No, sir, I have not. During the greater portion of November and part of December we made straight water gas, and we have made water gas altogether for the past six weeks. I do not find any such effect at all. I have no doubt that, with some of the apparatus, of course, the water gas is a fixed gas as it comes from the generator, and in loading the gas with the vapors of petroleum, if there is a sufficient amount of heat present, the naphtha vapors absorb it, and it is rendered latent in the vapor and results in a permanent gas at ordinary temperatures. The peculiar construction of our apparatus is such that we are enabled to make nearly all hydrogen and carbonic oxide with scarcely any (or a very moderate percentage) carbonic acid. The loading up of this water gas with oil vapor is accomplished in the second cylinder. There is no attempt to gasify the oil in that cylinder. The attempt is to vaporize it and load up the gas with the vapors of hydrocarbon. The superheater is of sufficient size and length to allow the gas to pass through it at a moderate rate of speed. No one point is at a particularly high temperature, but all are high enough to allow the heat to become latent in the vapors of hydrocarbon and produce a fixed gas. In our drips, and in our purifiers and other places we have not found the condensation that we found from coal gas.

Mr. Starr—Have you ever had any trouble with your meters leaking?

Mr. Faben—No, sir.

Mr. Starr—We have had a good deal of trouble.

Mr. Faben—We have heard no such complaints. The sore spots, as we term them, of course, manifest themselves on the holders and points of that kind, but as to the meters or mains or services or gas fixtures, we have never had any complaint.

Mr. Starr—Do you get any naphthaline?

Mr. Faben—No, sir; it has not manifested itself anywhere.

Mr. Somerville—Do you send your water gas through the same process and apparatus that you used to send your coal gas?

Mr. Faben—In connecting the apparatus up we have an old holder in the yard, and that is used as a relief holder. The gas on leaving the apparatus or generator is destined to that holder, and on the way there a connection is made, with a valve, to our exhauster, and the water gas passes through the scrubber and condenser before it comes to that point, and then it passes right through our coal gas apparatus.

Mr. Somerville—I have observed, in the making of water gas, that a great many commit what appears to me to be a mistake. The gas is passed through at a very high temperature, and immediately is plunged into the condensers; and I believe there it loses a great deal of its hydrocarbon. I have never understood why that was done. Why not the same process with the water as with the coal gas? I am certain if the condensers were put at proper distances to allow the gas to cool slowly the results would be a great deal better. I do not know whether anyone here does that or not. In all the water gas apparatus I have seen the gas goes from the superheater into the cooler in a distance of about 10 feet. I am certain that is wrong; but the plan seems to be followed, and everyone seems to continue the same process.

Mr. Faben—I imagine that the real purpose of connecting the apparatus up short is, in operating the machine it is possible that with a longer connection it would very soon fill up with lampblack, and by having the machine coupled up short, using tees and crosses instead of elbows, it is possible to clean out the apparatus very readily. While we have no trouble in that way at all, I do not know of any other purpose. The scrubber seems to be constructed for the purpose of knocking out the tars, and particularly the soot. The condensers occur after that. Of course, having this relief holder, we are enabled to pass it through our whole works steadily. It goes through the works at the same rate of speed that coal gas does, except we accomplish in 20 hours what otherwise would require 24.

Mr. Monks—I came here as a listener, not intending to say anything; but as this is a subject to which I have given some thought and attention, therefore the discussion upon it is to me particularly interesting. On this point that has just been spoken of—in regard to putting gas into the relief holder—we had a very good illustration in the gas works of the South Boston Company. They put in supplementary water gas there for the purpose of helping them out on their holders, rather than increase their holder space; and by not having a relief holder, but by mingling the gas indiscriminately with coal gas, they produced a great deal of dissatisfaction among their consumers—so much so that they were brought before the Gas Commissioners of the State, and were obliged to change their method of manufacture. Now, it seems to me that every gas works in all the large cities of the country, and in all the larger places, are ultimately to be supplied with a set of works that shall be able to manufacture coal gas or water gas as occasion may require. It seems to me that a water gas apparatus is a modern tool, so to speak, in our hands, to help us fight our part of the battles for our share of the business.

Mr. Somerville—Did you use your own coke, Mr. Faben?

Mr. Faben—Yes; we used it as long as we had any, and then we bought coke from the Pennsylvania regions.

Mr. Somerville—I find I can make better water gas from soft coke than from hard coke. It seems to retain the heat better. The hard coke does not seem to attain to the same intensity. The only difference is that it requires a great deal more shoveling on the part of the men; but we find we can make better water gas from it, so we use our own coke. We have used it now for a long time. We make coke and make water gas out of it.

Mr. Faben—The peculiar construction of the different water gas apparatus would permit the use of soft or hard coke. I think the shallow generator, as operated in the Granger type, would scarcely permit the use of soft coke, because, in blowing up the fire, you get a high state of incandescence in your generator before you get sufficient combustible gas to carry forward to heat the second part of the apparatus. With the type of apparatus we have, we are able to carry from 5 to 6 feet of fuel in our generator, and, using soft coke, a short blow will bring the fuel to a high state of incandescence, and, having that depth of it, we are enabled to produce hydrogen and carbonic oxide and very little carbonic acid.

Mr. Lindsley—I would like to inquire what sort of an apparatus you use?

Mr. Faben—The type we use, I think, is known as Humphreys' arrangement of a combined Lowe and Granger. The same type of apparatus that was put in Chicago a year ago.

Mr. Cantine—I would like to ask what is the essential difference between the United Gas Improvement Company's apparatus and that of the Springer Company, or the National Gas Light and Fuel Company's apparatus?

The President—Mr. Evans could probably enlighten us on that subject.

Mr. Evans—I believe that recently Springer sold out his rights to the United Gas Improvement Company. The Springer is not very different from the Lowe or the Granger in method of manufacture, only in some little points of construction. The Springer is fed by a side attachment, and is constructed with water grate bars. The Lowe has the firebrick grate bar, perforated. The Granger has the generator set down and the super-heater attached near the top. All of these apparatus have a superheater composed of firebrick, but are essentially the same thing.

The President—I would say before we adjourn that Mr. Monks, of Boston, has a collection of ancient lamps at his room, No. 10, Wilder House, which you will find very interesting. Perhaps Mr. Monks will explain to us just what his collection consists of.

Mr. Monks—By invitation of the Boston University, and subsequently, I delivered an address on the subject of "The History and Growth of Artificial Lighting," and exhibited a collection of ancient lighting apparatus, of which I made a sort of "hobby," and which, perhaps, in its way, is as complete as anything in this country. Some few articles I thought might interest members, and I placed them in my trunk. After supper, if any one will take the trouble to look into my room, and would be interested in such matters, I would be very happy to show them the collection.

Upon motion the Association then adjourned until 7.30 P. M.

FIRST DAY—EVENING SESSION.—MARCH 20.

The sessions were resumed at 7.30 P. M.

ANNOUNCING THE COMMITTEES.

The President—Before proceeding with the reading of papers I will announce the following committees:

On Legislation.—H. Wilkiemeyer, A. J. Stoll and the President for the ensuing year.

On Next Place of Meeting.—Edward Lindsley, Chas. R. Faben, Jr. and Jos. Gwynne.

On Memorials.—Geo. W. Graeff, Jr., R. T. Coverdale and Joseph M. Bate.

Next in order will be a paper by Mr. Geo. H. Tayler, Warren, Ohio.

Mr. Geo. H. Tayler then read to the Association the following paper on—

A HOLDER TANK PROBLEM.

Mr. President and Gentlemen:—In the year 1883 it became necessary for the Warren Gas Light Company to build a new gasholder. In excavating for the tank at a few feet from the surface of the ground we ran into a blue shale rock, or soapstone, which could be removed with pick and plow; but as we went down the rock became harder, until plow and pick failed to give satisfactory results, and for the last 5 or 6 feet we resorted to blasting, leaving the frustrum of a cone in the center.

The tank wall was built of brick, was three bricks thick, and had, on the inside, pilasters, to which were secured the plates which are traveled by the lower guide-wheels of the holder. In building the wall, 8 inches on the outside and 8 inches on the inside were first laid to a height of about 2 feet, and each wall plastered on the inside and outside. In the 8-inch space between the walls cement was first poured, and then bricks were dropped into the cement without any care further than to see that the space was well filled with them. In this way the wall was built up to the water line, which is about three inches above the surface of the ground. It was then covered with 8-inch stone, wide enough to answer for a water table, a foundation for the holder house wall, and a 16-inch walk all around the inside of the holder house. The brick wall for the holder house was then laid, and on top of it was anchored a ring, made of 4-inch angle iron, to receive the ends of the rafters. On the bottom of the tank broken stone was laid to the depth of 10 or 12 inches, and grouted; on the top of this one course of brick was laid. Akron cement was used throughout the job.

The space outside of the holder wall was filled with a loamy clay, which was allowed to fall into water; the water being run in fast enough to keep the clay covered. The holder is 60 feet in diameter, and 18 feet high, having a capacity of something over 50,000 cu. ft. It was completed and put to use in December, 1883. The leakage from this tank is small, the water from the roof keeping it full.

When all was completed and had been in use a few months, I thought I had a model holder house and tank; but I have since learned the work is faulty in some respects—particularly so in one. Cracks have gradually appeared all around the wall, extending from the water table down into the tank wall some two or three feet, and up into the building wall to the windows, which are four feet above the water table. Three or four of the stone window sills are broken, and show cracks nearly a half inch in width. In some instances the cracks appear again at the top of the windows, and extend upward about two feet. The cracks are greatest at the water table, where they aggregate, around the building, about seven inches, indicating an increase in the diameter of the building of over two inches. Those which extend downwards into the tank wall do not seem to be of a serious nature, for the water in the tank does not lower much. At the present it stands at two inches below the overflow pipe.

Last fall I had the building pointed up, and all of the cracks filled with cement. At present, cracks show themselves again—perhaps none large enough to receive the blade of a trowel; but cracks there are, and many of them.

Now the question suggests itself, what is the cause of the moving of the wall; and what the remedy?

Has the four inch angle iron on top of the holder-house wall, which receives the weight from the roof, and is subject to expansion and contraction, anything to do with it? The expansion of the iron ring could hardly be great enough to crack the wall; and in fact, the top of the wall shows no cracks.

Is the water from the tank, and from the ground, which is at times saturated with it, drawn up into the brick wall by the force of capillary attraction and held there till it freezes, thus thrusting the wall out? And, if so, would the trouble have been prevented had the top of the tank wall been two or three feet above the surface of the ground? Or would a layer of roofing slate, a coat of pitch, or a course of sheet lead, laid on top of the tank wall and under the water table, have prevented this act of capillary attraction, and thereby have protected the wall?

But perhaps we should look inside for the cause. Let us see. The holder does not settle evenly into the water; when it is nearly full of gas, one side sets seven or eight inches deeper than the other; sometimes it is the south side, sometimes the north. When the holder is full the bottom of it has a play sideways of about four inches; and when it is only one-fourth full the top has a play of about two inches. The guide-rails traveled by the upper wheels are secured to the building wall by iron brackets, the lower end of the rails resting in iron plates embedded in the stone which form the water table; so that when the holder is low any thrust or pressure caused by the tilting or leaning of the top is in a great measure received by the water table.

The top of the guide-plates traveled by the lower wheels lay up against the stone, so that any thrust or pressure, caused by the tilting or leaning of the bottom of the holder when full of gas, is also received by the water table. If this be the case, it would seem that to straighten up the holder and keep it so would prove a remedy so far as any further acting of the cause is concerned; but it would not be a remedy to the damage already done to the building.

Now, gentlemen, if I have directed your attention to something new to you in the gas business, I shall be well paid for presenting this little paper. On the other hand, if what I have presented is not new to you, I hope you will give me the benefit of your knowledge and experience to help me out of my trouble.

Discussion.

The President—You have heard Mr. Tayler's interesting paper on this subject; what is your pleasure with reference to it?

Mr. Printz—I would like to ask Mr. Tayler as to the thickness of this holder-house wall that he speaks of; whether it is a light wall or a heavy one? Again, when the holder was first completed did it float as loosely as he speaks of now, or did it work snugly into its bearings?

Mr. Tayler—The holder house wall is a 12-inch brick wall. The holder did not float as loosely as it does now. The building has spread over two inches. The diameter has increased at the water table over two inches, and that is the difference between the swing now and what it was when the holder was first constructed. It was loose before.

Mr. Coverdale—Without thinking the matter over very deeply, on the spur of the moment it occurs to me that 12-inch wall is rather weak. We all know that the lateral stain of brick work, especially if it is new, does not amount to much. The downward strain is good enough, but the lateral strain is not. It is an easy matter to push over a green wall. Now the holder seems to have tilted over, and the whole weight of the holder appears to have come on this outside wall. That might cause the cracking of the outside wall, but I do not see why it should crack the tank wall; I do not quite understand that, unless there has been another thrust in an inward direction on that tank wall. Is the wall laid with brick or stone?

Mr. Tayler—It is of brick, except the course between the two, or what I spoke of as the water head; that is stone, 33 inches in width, I think.

Mr. Starr—Isn't your holder-house wall built on the outer edge of your tank wall?

Mr. Tayler—Yes.

Mr. Starr—That may have caused it.

Mr. Tayler—I will say that the tank wall is not cracked to any great extent, as you can see from the fact that the tank stands full of water, or within 2 inches of the overflow pipe. The cracks show themselves on the outside extending 2½ feet into the ground, and any thrust that was made by the holder, either when it was nearly full or when it was nearly empty, would in the main be received by the water head.

Mr. Lindsley—I would like to ask what the backing of the tank wall is?

Mr. Tayler—It is simply clay loam, dumped into the water and allowed to settle; what you might call puddled clay.

Mr. Lindsley—That material was used clear to the top, was it?

Mr. Tayler—Yes sir.

Mr. Printz—Was this house wall built any length of time before the holder was filled; or was the holder built and then the wall built up around it and the holder filled immediately, so that it was raised right against the wall?

Mr. Tayler—The building was completed before the holder was put in. The holder was built inside the house and I should say was finished between two and three months before the water was put into the tank.

Mr. Printz—The way you speak of backing that wall, it does not appear to me as solid a way of backing as it should have been.

Mr. Starr—I would suggest that this eight inches you speak of as being built of cement does not "give" any, and in the course of a few years the freezing and thawing may have caused the walls to settle, and that has thrown the bottom of the house wall out, as the inside eight inches did not "give" any. That may have been the cause of it.

The President—Is there any more light upon this subject?

Mr. Lindsley—I take it there were heading-courses, were there not, Mr. Tayler, at suitable distances all the way up?

Mr. Tayler—Yes sir.

Mr. Lindsley—So that the center does not stand wholly as a matter of filling?

Mr. Tayler—No; there were heading courses about every 18 inches.

Upon motion of Mr. Printz, the thanks of the Association were tendered to Mr. Tayler for his paper.

The President—Next upon our programme is a paper by Mr. Geo. W. Graeff, Jr., Philadelphia.

Mr. Graeff then read to the Association the following paper on

THE WELSBACH BURNER AS A COMMERCIAL ARTICLE.

At the last annual meeeting of this Association, in connection with my paper, I exhibited several incandescent gas burners, the chief of which was the Welsbach. At that time this burner was scarcely out of the experimental stage, and, while it gave good photometric results and great promise of practical utility, its defects were many. Since then the advances made in its construction have been marked, and the burner, as it stands to-day, can safely be said to be a mechanical success and an article of commerce. As these results depend each upon the other, and may be classed as one, I desire to simply state the principal changes made which have placed the Welsbach upon a business plane.

To those of you who saw the burners of a year ago, as exhibited at the meeting of this Association or elsewhere, it is scarcely necessary, in view of those we have with us to-night, to emphasize the fact that great improvements have been made.

These improvements, as you see them to-night, are not simply what might be termed surface improvements, but are the results of hard study and costly labor, and conduce to the permanent symmetry and durability of the burner, as well as to its general utility as a high candle light-giver. Practically these improvements may be chiefly tallied as follows:

The Mantle.—The elaborate experiments made with reference to the composition and preparation of the mantle have resulted in a much greater control of these two points than was deemed possible a year ago. Then, the life of the mantle was a matter of considerable dispute, and tests made of 500 or 600 consecutive hours were considered as very severe. To-day, under fair conditions, 1,000 hours is not a long life for the burner, and instances of more than double such life are plenty. In the writer's experience, in a room containing 1,850 square feet of floor, ceiling and wall space, all of which, ceiling excepted, was dark, one of these mantles, burning for 1,944 hours, gave at the end of that time light sufficient to read ordinary print at a distance of more than 25 feet. The mantle was in good condition, and it would have taken some one well versed in the handling of these burners to have told that the mantle was not a new one. In addition to increased durability, the mantle as now prepared has an initial candle power of from 25 to 30 per cent. more than the mantle formerly used. The color of the light obtained from these new mantles is slightly more yellow than that from the old one, and may readily be made of as deep a yellow as desired. Another important feature consequent upon this improvement is that the mantle retains its shape when in use very much better than formerly. In the mechanical construction of the mantle the most important thing is the cuffing or close knitting of about three-quarters of an inch at the top, materially adding to its strength and symmetry.

It may be well to note here that in place of coating the mantles with the old mixture of shellac, etc., a varnish preparation (known as crystalline) is now used for the pupose. This protects the mantle much better, makes transportation by mail both possible and easy, burns off with less smoke and odor than the former preparation, and when used in conjunction with the corrugated tip, which will be mentioned hereafter, it renders possible the burning-off of the mantle in position.

The Lock-Stirrup.—The difficulty experienced by the gradual opening of the ring in the old stirrup has been overcome by making a turn at the end of the wire, so as to clasp the bend of the ring at the top of the supporting rod, locking it firmly in place. This renders the closing of the neck of the mantle an impossibility.

The Burner Tip.—Perhaps no part of the burner has undergone more change than the tip. After a series of practical experiments, the company has finally adopted the use of two convex iron gauzes separated by a short distance, and varying in mesh from No. 16 to No. 24, according to the use to be made of the burner. The shell holding these gauzes in position has been made in the form of a fluted cylinder, so as to admit a small quantity of air directly inside the mantle. This enables the crystalline to burn off readily and without cementing the mantle fast to the tip, and also effects a more perfect combustion of the Bunsen mixture.

The Bunsen Tube.—The air is now admitted through three rectangular slots of large size at the base of the tube. This insures a sufficient supply.

The Air Shutter.—After considerable change and experiment, this is now made perfectly adjustable, with three large radially cut openings capable of admitting, at the maximum, all the air the burner will take.

The Gas Check.—In place of the old 5-hole brass check, which gave great trouble by clogging, through corrosion of the copper, a 3-hole check of non-corrodible material is used. This change overcomes quite a series of difficulties previously attributed to almost every part of the burner.

The Governor.—Where economy or perfect uniformity of action is required, a good volumetric governor is placed under the burner and adjusted in conjunction with the gas check so as to eliminate all variations of pressure.

The Chimney.—The most practical chimney has, I understand, been found to be the plain Argand, of 10 inches in length. Of shades it is not necessary here to speak, as while there are certain forms that are preferable, the range of shade that can be used is too extensive to notice in a paper of ordinary length.

With these improvements, as now perfected, the burners can be sent out from the factory to suit any kind of gas used. The data necessary for proper adjustment are: The kind of gas used, its candle power or gravity and the minimum pressure at the burner tip. From these data, the burners are adjusted at the factory, packed in boxes and mailed or expressed anywhere. The crystalline mantle carries perfectly, and as the burner is sent complete in all its parts, all that is necessary in putting it into service is to unscrew the old burner, replace it by the new, turn on the gas and light it. The crystalline burns off in a few seconds and the light settles down to work without any further attention.

The mantles are mounted so that the distance from the gauze-tip to the ring of the stirrup shall be from $2\frac{1}{2}$ to 3 inches, according to the pressure available; the shorter ones working well on as little as $\frac{5}{10}$ water. Two and a-half inch mantles on $2\frac{3}{4}$ cubic feet of coal gas per hour, at $\frac{6}{10}$ of an inch pressure, give an initial candle power of from 25 to 30 candles, while 3 inch mantles, on from 3 to 3.2 cubic feet of gas per hour, at $\frac{8}{10}$ pressure, give an initial candle power of from 35 to 40 candles.

It may be well to mention here that while the burner is made adaptable to any kind of gas, its recent successes with natural gas are beyond reasonable expectation. Since arriving here, I am creditably informed that with a consumption of gas averaging not more than three feet and a pressure of six ounces, the candle power derived varies, according to the quality and composition of the natural gas, from a minimum of 40 to a maximum of 60 candles. These results, as I understand, are attained to-day at Pittsburg, Indianapolis and Muncie. From other points I have not heard definitely.

I think these points, all of which I believe to be capable of easy substantiation by test, demonstrate the superiority of the burner as it stands to-day, and show that it has been taken entirely out of the fields of doubt or question.

Discussion.

Mr. Graeff—Mr. President, I had expressed to me, in order to test whether these burners would carry safely or not, this package, which I have not yet seen the inside of [producing package.]

The President—I thought that it was a box of cigars. [Laughter.]

Mr. Graeff—No, it is not cigars; it is a "light" lunch. [Renewed laughter.] I think this will demonstrate one part of the paper.

This package [exhibiting package] was packed, sealed by the United States Express Company, and sent in a larger package to me, and you can see the condition in which it arrives. This air shutter [exhibiting same] is the latest improved air shutter. It is of an entirely different character from the one used on the burners in this room to-night. I would say that these burners, which represent the Welsbach burner of to-day, are free for any one's examination.

A Member—What do they cost by the quantity?

Mr. Graeff—I understand that the price has been fixed at $2.50. That is the retail price, and what the rebate is to gas companies, or to persons who sell in quantities, I do not know. The mantles, I believe, cost, as they did a year ago, 50 cents each for renewal.

A Member—They are all one size, are they?

Mr. Graeff—Yes, sir; all that are sent out I believe are of one size. The mantles can be sent out in packages, of course, by themselves. Original mantles are sent out from the factory in this shape [indicating], and can be adjusted to the kind of gas used in the town to which they are sent. Therefore, the same mantles, by different adjustments at the factory, can be made to serve a hundred different places.

Mr. Alexander—I would like to ask Mr. Graeff if a gas company that wants to buy Welsbach burners now can buy them without paying royalty for the privilege of selling them in their town?

Mr. Graeff—Well, I would state, Mr. President, that I do not represent the Welsbach Company in any sense. If I represent anything in this matter it is the urgent solicitation of your Secretary. I have no connection whatever with the Welsbach Company. The terms of sale I do not know further than the retail price of the burner. How they are putting them out, or how they intend putting them out, or under what terms they intend to put them out, I do not know.

Mr. Alexander—I will say that I wrote to the Welsbach Company a few months ago, asking them on what terms I could get them for our Company in Painesville. I stated the number of consumers we had, and the population of the town, as I had some intimation that they charged in proportion to the population of the town. I wrote that we had about 5,000 population, and they wrote back that I could have the privilege of selling them by paying them 75 cents a head for each inhabitant of the town, men, women, children, deaf, dumb and blind, they would sell them to me at a discount off, if I would do that. I did not know but what it was the same way now.

Mr. Graeff—As I say, I know nothing whatever about the terms. My only interest in the Welsbach Company is that I consider it my business to endeavor to force gas consumption, and I believe the best way for doing that throughout this country is by constantly pushing the question of fuel gas and incandescent gas lighting; and I have simply taken up, to a limited extent, the Welsbach, because I cannot help but think it is to-day the foremost incandescent lighter. There is only one other in this country that is in use to any practical extent. My interest, as I say, is simply in incandescent lighting, and not the individual burner, further than as it represents a mechanical success.

The President—Is there anybody else who would like to ask Mr. Graeff questions in relation to this subject?

Mr. Evans—I should like to ask Mr. Graeff how the mantles are shipped; whether or not it is necessary to send the whole fixture, including the burner, in order to send a mantle.

Mr. Monks—I can answer that question, if Mr. Graeff is not prepared to do it. The shipments are made in a little pasteboard box, which contains two mantles, one facing one way and one the other.

Upon a motion a vote of thanks was tendered to Mr. Graeff for his paper.

An Invitation.

The President—Gentlemen, I understand that the city officials of Mansfield and the board of water works are here, and we wish to extend to them a hearty welcome and hope they will get thoroughly acquainted with us gas men. [Applause.]

Upon motion, the Association then adjourned until 9 A. M., March 21st, 1889.

Second Day—Morning Session—March 21.

The sessions of the Association were resumed at 9 A. M.

Routine Matters.

The President appointed the following Committee on Nominations: Messrs. Henry Padan, Portsmouth; Eugene Prints, Zanesville, and W. A. Ross, Kenton.

The report of committee on place of next meeting was called for, and Mr. Lindsley reported that Toledo, O., had been selected. On motion, the report was adopted.

The President—While the Committee on Memorials is getting ready to report we will go on with another paper. It was our intention to have paper No. 5 read this morning, but Mr. Light has disappointed us. He is not here, and we have not been able to hear from him. We have sent him two telegrams, but have received no word in response.

Mr. Faben—Mr. President, I believe it was arranged, as a special order of business for this morning, to consider the matter of changing the name of the Association.

The President—We intend coming to that after this paper.

The Secretary—It might now be in order, Mr. President, for me to say that Mr. Hurlburt, who is on the programme for a paper this morning, has requested me to announce that immediately upon having consented to furnish the paper he was unexpectedly assigned arduous duties at his works at Oberlin, which so engrossed his time that he has found it impossible to do either himself or the subject assigned to him justice in the short paper that he has prepared; and he, therefore, asks to be excused from reading it, with the promise that with new works and new facilities for making tests at his command he will be prepared with a paper on the same subject at our next annual meeting.

The President—The next paper will be read by Mr. Strong of Mansfield.

Mr. Strong then read the following paper on

THE RESULTS OF THE ADOPTION OF ELECTRIC LIGHTING BY A GAS COMPANY.

Mr. President and Gentlemen: On broad business principles, the sentiment and action of the day are in the direction of the consolidation of kindred interests, prompted by considerations of economical administration and efficiency for resultant gain. On all sides and in every department of the business world we note conspicuous examples and great successes. In this point of view, with similarity of purpose, there seems nothing more natural and inviting than the practical consolidation of the rival lighting interests (gas and electric), a combination of business with best conditions for securing economy and efficiency of service. Recognizing the presence of electricity in the field of illumination, with its wonderful power backed by a popular demand that *must* be met, it seems to stand before the gas interest as its "best friend or dearest foe." These considerations prevailed with us here, and induced a consolidation of the gas business with a local electric lighting company, which was struggling along under indifferent, unsatisfactory results in its independent capacity.

We may spread and cover pages with theories, but it is the condition of satisfactory returns that interests and convicts; and while it may be questioned if here we have had experience long enough to determine and settle definitely the doubts of conservative, inquiring minds, so far the consolidation had met the moderate expectations entertained when we determined our action.

With the view that each system of lighting had its special field of usefulness, we have managed the electric department as an ally of the gas business, believing that gas would still be found popular and adequate to meet the demand for a cheap and good illuminant, using the arc to fill the want on street and in large area lighting, and for the few who will have it, regardless of economy. We have kept steadily in this relation, charging for the service of each on a moderate schedule, at the same time endeavoring to maintain and improve the efficiency of the gas business, and believe it demonstrated in our experience that the service and result in each department have been satisfactory without robbery, one of the other, in the special province or field of each; and while the result may be by some considered as unfairly affected by such control, it has been a pleasure to have the confirmation of our hopes that the returns in this department would not be at the expense of the gas interest, which had kept steadily to the front.

We say our moderate expectations, because our early investigations, confirmed by our practical experience, compel us to doubt the claims made by some over-zealous or reckless advocates of electric systems, and that the truest and best results are more likely to be secured with a well-equipped, well-managed gas company at the helm.

A satisfactory result of our experience is on the public side of it. Here we were getting unsatisfactory returns for gas furnished to the street lamps, with the public demanding and waiting for something better. With the arc the situation is changed, and our relations to "the powers that be," municipally, have been more pleasant and harmonious.

While the results in our plant have been fairly remunerative, we incline to the belief that an independent company, operating an electric lighting plant in any of our cities, cannot develop equally favorable financial results comparatively with those of a carefully managed gas company selling good gas at fair prices, and, in competition, would probably be the worse sufferer, yet, a combination of the two, with consequent economy of service and management, best serves and secures the interest of each, and should show a fair profit.

We started our plant in November, 1887, using considerable care in construction, with consequently a minimum item for repairs, and for the year closed have had a fair manufacturing profit on the business.

In view of what might be inferred from the subject assigned to me, I may have indulged in, perhaps, too general statements, many of which have been previously considered and weighed; but, while considerations that doubtless suggest themselves hardly permit a statement here of operations, we shall be glad to give all information possible to those considering their interests, and we wish to add the confirmation of our experience to that of those who preceded us in the plan of combination and found it the path to peace and prosperity.

Discussion.

The President—You have heard the paper read by Mr. Strong; what are your wishes concerning it?

Mr. Faben—Mr. President, the paper just read is very pleasing and interesting, and I move a vote of thanks be tendered to Mr. Strong. [Adopted.]

The President—I think this paper ought to be discussed somewhat. Everybody is interested in the subject. Discussion is now in order.

Mr. Somerville—I believe that Mr. Strong is running this electric railway at Mansfield; is that not so?

Mr. Strong—No, sir.

Mr. Somerville—I would like to ask—perhaps he may be able to tell me—if it is more economical than the old style, with horses or mules?

Mr. Strong—To outsiders, and perhaps to those inside of the street car company, it is considerable of a question as regards the comparative efficiency and economy of our electric road. Of course, in our location here, while not impossible, yet it would require a very large expense to operate a horse car line, on account of our grades. But we understand that the parties who are on the inside in the enterprise are very confident, and claim very emphatically that it is a substantial saving of about 33 per cent. over a horse car line. How true that is of course I cannot say.

Mr. Somerville—The citizens have not complained about the overhead wires being dangerous, or made any objections?

Mr. Strong—No, I think not; nothing has come to the surface.

Mr. Cantine—I would like to have a very full discussion of this question. There are very many of us here who are deeply interested in this subject. I do not know very much about it, and came here more perhaps to learn than anything else. Here are our friends, Mr. Faben and Mr. Strong, and our worthy President, and several others whom I might name, who have been in the business a long time and have a good deal to say, and can give a good deal of light on the subject, at least a good strong electric light. (Laughter.)

The President—What's the matter with a good "Strong" light? (Laughter.)

Mr. Cantine—The question has been broached here as to the feasibility or advisability of changing the name of this Association, and some have favored it. I have, to this extent, that I would like this question fully and freely discussed; but I do not care particularly to see the manufacturers of all the different electric systems come in here and capture this outfit, as I think they would attempt to do. We can give our personal experiences and state to each other what we think are the best systems, what is the best engine, what is the best plan of setting the boilers, what are the best kinds of carbons, etc., but we would dislike very much to do anything of the kind if the parties who manufactured these articles were present. We would be greatly embarrassed by their presence.

The President—Any further remarks?

Mr. Faben—I do not know that I can contribute very much to the enlightenment of the Association on this question. I have been delegated the manager of an electric light company and have conducted its business to the best of my ability for about two years. The desirability and feasibility of combining the gas and electric light interests in a city, I think, are determinable on purely local circumstances. There are situations where I do not think it would be advisable to combine the gas and electrical interests. That would be in the larger towns, where the gas business and electric light business each would be large enough to make a separate and distinct business. One serious objection to combining the two is that it would rob the community of that competition which they demand in some form. If a man is at liberty to buy from whomsoever he likes, untrammeled, he will be likely to use more than if he were obliged to buy from one person. The community are quick to perceive when they are told "If you don't like gas, take electric light, and if you don't like electric light we will furnish you with gas," that they are buying from one fellow, and there is no redress. That of course would not apply to small towns where two separate organizations could not exist, and the business of either would not be large enough to make each business a specialty. Each of us managers who is operating an electric light plant, knows which is the best electric system, but we cannot mention its name for less than the usual rates (laughter). In some instances I have no doubt it is like the old story that was told yesterday by somebody who said it didn't make any difference what hotel you stopped at, when you were through you wished you had stopped at the other (renewed laughter). Coming back to the question that was raised by Mr. Somerville in regard to the electric street railway, my information is that in Mansfield a horse street railway would possibly be a failure, at the present time; and the grade alone would not be the only cause for that; for they do not get the business, and they are forced to do what business they do at the same rates that street railway companies in large cities get for their patronage. The demand for electric railways comes in towns where rapid transit is necessary. A few years ago I was in the city of Richmond, Va., and saw the electric street railway there. I did not investigate the details of its operation at all, but asked the sentiment of the business people there, and they all declared it was a great success. I rode on the street cars and they maintained a much better rate of speed through the business portions of the town and between blocks than by the ordinary method, and in the suburbs we made a very much better rate of speed than is made by the cable roads of Chicago. As to the financial part of it, I cannot answer; but as a means of rapid transit it is certainly a success.

Mr. Cline—Mr. President, there is a general desire upon the part of the members of the Association, who are aware that you have combined the gas and electric light interests, to hear from you with reference to the matter. (Applause.)

President Wood—I think everybody knows where I stand on the combination question. We have now been running the two together for three years, and it has been perfectly satisfactory to all our stockholders, and if they had the same thing to do again they would do identically as they have done. I do not see why one lighting company, whether furnishing gas or electric light, or both, is not better than two. I think one company can supply light cheaper, and make more money. It is a benefit to the community and a benefit also to those who are operating the plant. We run the arc, the incandescent, and also the gas lighting, and the three combined net us a very nice profit and give good satisfaction to the public in general. I do not know of anything I can say that I have not said already, either in papers or by word of mouth. We look upon it as a grand success, and advocate it, and stand on that ground, and expect to stand on it.

Mr. Somerville—There is one question I should like to ask: For a company furnishing gas the city sets up a standard—that the gas is to be of a certain candle power, generally 16, and free from impurities; and we have to furnish a light according to that standard. I would like to ask if the same course is pursued with regard to electric light? I hear you speak of a 100 candle power lamp, and a 60 candle power lamp, and a 16 candle power lamp. Who determines and who measures that light? What is the standard? What kind of a photometer is used to find out these standards of light; and are you bound by any conditions from the municipality

to keep up the light to that standard? I should like to hear if you have to do that and if you are kept right down, the same as with gas, to that standard? And if we gas people go into it would we be subject to these restrictions as to candle power and purity of light, and penalty upon failure, etc.?

The President—As far as candle power is concerned, we have had no trouble on that score. We show them the light and tell them that is the kind of light we are going to give them, and we don't care whether it is 2,000 or 3,000. (Laughter.)

Mr. Cantine—I would like to ask if there is any difference in regard to the incandescence. For instance, when you start out with gas at 16, or 18 or 24 candle power, or whatever it ought to be, you can keep your light up to that standard. I believe gas managers say they do that, and do do it. That is not true with incandescent lighting, as I suppose you already know. The first 300 hours of its life it is a very much better light than the last 300 or 400 hours, or whatever it may be. If you had here an incandescent lamp that had been used 300 or 400 hours, you would see, if it were a 16 candle power lamp at the start, that it would not be, by any test you could make, over an 11 or 12 candle power lamp at the outside. Every time you turn off an incandescent light, you see by daylight a little puff of smoke. That smoke cannot get away from there. It is in the vacuum and obscures the glass and, of course, obscures the light. I am interested in a plant 13 miles west of here, and we have incandescent as well as arc lights. When we put them in, the railroad officials were exceedingly well pleased with them, but in the course of 15 or 20 days they began to complain that the lamps were not giving as much light as they did. They said maybe we had decreased the voltage. "No, we hadn't." They wanted to know what was the trouble, and I showed them. They said: "You have to throw those lamps away and get others." I did not agree to do that and I did not propose to do it. Now that is a question that comes up with almost every user of that kind of light, and we do not have the same trouble with gas. Mr. Faben says that in some places he doubts the propriety of using electric light in connection with gas. I respect his judgment as much as any gentleman connected with this Association, and he is no doubt in some cases right. But where combination is possible, competition is impossible. In the city of Cincinnati, Gen. Hickenlooper, who is President of the Gas Company, and a man certainly who has as much knowledge on that subject as any other, inclines favorably to electric light. He has been somewhat slow in adopting it, but nevertheless he is going to do it. The three companies there competing with each other, are not satisfactory to the city, and it is a great question whether any one of them has ever made a dollar under a proper construction of their expenses and the capital they have invested; nor have they put up their lines in a shape that is at all workmanlike or mechanical. If the Cincinnati Gas Company can do electric lighting successfully and safely, I do not see why any other town cannot do it; or why every small town in the State of Ohio should not do it. If there is anything that pains me it is to see any gas company worsted in this electric contest.

Mr. Faben—Mr. Cantine has slightly misunderstood one statement I made. I qualified my statement by saying that the union of the two interests should be governed by purely local conditions. I do not doubt that in Gen. Hickenlooper's case, and in many cases that will hereafter come up, their business will be large enough in each of those branches to make a special branch of business of each one. All of us have other interests than our gas interests. If we were to embrace in the title of our Association the various enterprises we are interested in, aside from the gas interest, or the electric light interest, we might go on and make it the "Merchant's Association," or the "Bankers' Association," or the "Clerks' Association," and so on. The point I was trying to get at was that the community would be best served and the money best invested if each interest were specialized. The tendency in every other department is to specialize. In science, in philosophy, in medicine and in all the varied departments of our worldly affairs, the tendency is to specialize. To-day we have the specialist who does nothing but attend to the eye and ear. Within the recollection of many of us, and especially those living in smaller towns, the doctor was not only physician and surgeon, but was druggist and chemist. He prepared his own medicines. That is not the practice to-day. The chemist makes the medicine, the pharmacist is supposed to know how to put the ingredients together, the doctor is supposed to know the effect that the medicine is going to have, and he writes his prescription of what he wants compounded, and the way in which it is compounded he is not supposed to know. If the tendency in all other departments is to specialize a thing, why isn't it so in our business? Now, if we had in Toledo enough business to enable us to devote our whole time and attention to the gas business alone, and could get business enough to warrant us to pay no heed to anything but the gas business, would not the gas business be better conducted and the people who are using gas better served by our devoting our whole attention to that particular business? If we load ourselves up with a multiplicity of businesses and attempt to generalize, instead of specialize, are not some of those interests, and the people that would be served by those interests, to be slighted? There is nothing to prevent Gen. Hickenlooper, or any other class of men, from engaging in an electric street railway, or they could go into competition with Proctor & Gamble in the soap business, and get up business enough to make each a specialty by itself. There are cities in this country who are demanding so many electric lights that it would be useless to attempt to furnish them from one station. They could put up a great many stations, and wouldn't the interest of the public be best served if they were divided into a number of companies, so that each company's business was a specialty in itself? I do not mean by that that there should be a full retinue of officers for each of these concerns. But wouldn't the electrical business be best served by having that carried on as a special business? We have made progress in this country that has not been made across the water. The people over there have been harrassed by parliamentary laws. There was a case that was reported by Carnegie in his article on "The Dangers of Trusts," which goes to show that it costs more to convince a Parliamentary Committee that a railroad is necessary than it costs the capitalist in this country to build a railroad. They have been under all manner of restrictions. In this country it is different. We can engage in experiments here that could not be tried in foreign countries. I have no doubt that in towns where the gas and electric light interests have been combined, the matter has been studied over by the local companies, and they, knowing all the conditions, have done the best they could under the circumstances.

Now, Mr. Somerville is from Indianapolis, where they have incandescent lighting, arc lighting and gas lighting, and where they also have natural gas; where they have had coal gas and water gas and the two gases combined. Perhaps he can enlighten this Association as to the conditions and results there, and tell us why they have not combined the interests of gas and electricity?

The President—Mr. Cantine was talking about the blacking of the globes, etc. When parties come to us and want incandescent electric lighting and ask an opinion about it, we tell them what we think is the truth. We tell them that we think they will be better satisfied with gas. But that usually don't do any good. They want an incandescent lamp. If they want to know whether it blackens up, we tell them "Yes;" that we can't tell how soon the globe will blacken up, or anything about it. We have incandescent lights, and just as good as anybody else's incandescent lights, and try to make them believe it is a little bit better! But our primary object is to sell gas, and if we cannot sell gas we will sell something else; and I think that is the beauty of the combination.

Mr. Somerville—We, in our place, have thought it best to adopt the plan that my friend Mr. Faben speaks about, of sticking to our business. We have thought it best to be on friendly relations with the electric light interests, and allow them to get a good price for their light, and by so doing they have allowed us also to get a reasonable price for ours. We have recognized the fact that there was room for both, and we thought a knowledge by the community of electric light would be a good way, perhaps, to satisfy the community what it is, and how it compares with gas. We have also recognized the fact, which has been mentioned, that the combination is more or less in the nature of a monopoly. We doubt whether it is a good thing to take the entire business of lighting into our hands. As has been well said here, the people naturally like a little competition. I do not say we are right, but that is the way we have managed it in our city and we intend to pursue that course.

Mr. Bate—In reply to a suggestion by Mr. Faben, that in some towns both interests are successfully run when the town is large enough, I will say that in our city (Canton) the gas company has a fair plant, and we are pushed to our fullest limit, and are required to rebuild more or less this year. There is a small electric light plant there which claims to be doing a fair business, and yet we have a very fair proportion of the street lighting. There is

a gasoline company, also, which has a nice section for lighting. They have endeavored hard to sell out to us, and the president of our gas company has considered the advisability of our purchasing it; but when he came to consider the fact that we are now doing all the business we can manage, he decided that if we purchased it the chances were we would be looked upon as a monopoly, and very probably a competing electric light company would come in. We do not see any reason why we should buy it as long as we making a fair showing on our own investment. The electric light company claim that they are making a very fair dividend, and so we are getting along very peaceably. I merely refer to this as an instance where the two interests are run separately and in harmony.

The Secretary—In Columbus, Ohio, where there is an Edison incandescent electric light company operating, I think, in the neighborhood of 6,000 or 7,000 lights, and where the gas company does nothing in the way of electric lighting, but sells good gas at $1 a thousand, we have occasionally former consumers of gas, who have been using the incandescent electric light a year or more, coming back to us, giving up their electric light and adopting gas again. I do not know whether the Edison company are now making a net gain of consumers or not. I would like to ask Mr. Wood, Mr. Strong and others representing companies that furnish both kinds of light, how their present gas output compares with what it was before electric lighting was introduced in their towns?

The President—As far as our Company is concerned, I think there was a gain last year of about eight per cent. in the output over the former year, when we did not have any incandescent lighting.

A Member—Has your electric lighting increased much during the last year?

The President—The incandescent lighting remains about the same. Of course our town is limited, and after you once get in all the hungry ones, the incandescent lighting don't grow very fast after that. We do not solicit any, but when a man wants it we give it to him, and give it to him at a profit to ourselves.

The Secretary—In Columbus we believe the incandescent electric light has cut into our gas output, and made inroads upon it to the extent of from 100,000 to 150,000 feet per day. At the same time we are sending out more gas than we ever did before. Our rate of increase is about as it was formerly, but this has been due largely to extending our mains throughout the suburbs and taking in territory wherever we could get barely enough consumers to justify the outlay; and also to our having reduced the price of gas to $1.

Mr. Strong—As said in my paper, we have made a small increase in our output for private consumption. We have not made up the loss in street lighting. Oil is probably sold at a lower figure here than at any other point in the State. We are told that gasoline has been sold here for a considerable length of time at such a price that a dealer here could buy it and reship it to any town in the State, and of course it has brought about a large business in the sale and use of oil. We have made a small increase in the amount of gas furnished for private consumption. In regard to the matter of combination, I think it comes home more closely and cuts a deeper figure in our small towns. I can conceive that in our larger towns, where gas companies have about as much as they ought to attend to to look after that particular business, perhaps it would be better to confine their business to that of gas, but in our smaller towns our municipal powers are demanding the arc light for street purposes. Unquestionably some one will knock at the door of the Council for a franchise, and after they get started they soon commence to canvass for commercial lighting. Under those circumstances, it seems to me that only one thing remains for a lighting company to do, and that is to adopt electric lighting as part of their system. The plant can be attended to very nicely without any large expense for service and supervision or office expenses, and unquestionably at a larger profit in furnishing arc lights for street purposes than there is to any company I know of in furnishing gas for street purposes.

Mr. Starr—I have been using electricity and gas for nearly five years. Parties came to our city and proposed to start an arc light system, but the scheme failed and I concluded to adopt it myself. I have a factory that I run through the day with water power and I turn on the electric light at night, so that it is practically at no additional cost. I give every one an electric light that wants it, but I do not go out to solicit anybody to take it. If orders for lights were energetically solicited I presume there would be twice or three times as many arc lights. I presume that I have had a hundred places that have used electric light, and the number is now reduced probably one-half. It is more expensive than gas and some get tired of it and drop it. As to incandescent lighting I put in a plant of my own, but I have not done much with it. It is more expensive than gas. Our gas is sold at $1.20 and if you have 25 burners burning 4 feet an hour, for 3 hours, that would be 12 feet to each burner or 300 feet a night, making it 36 cents a night, and that for 30 nights would be $10.80; whereas the incandescent lighting would be $12.50, counting each light at 50 cents a month. There are very few companies that sell their light for that. It is generally 75 cents to $1. Even putting it at 50 cents a light, it is 25 per cent. higher than gas at $1.20. As I say I do not hunt customers up. They come to me and I have never refused to give a man an electric light who comes to me and wants it, and yet it has interfered with my gas consumption but very little. I am making arrangements now to put in a larger plant; I don't know whether I will succeed or not.

Mr. Lindsley—In Columbus, does the introduction of the electric light displace the use of gas, as a rule? That is, in other words, are the meters usually taken out?

The Secretary—No; they usually retain the meters and burn a few jets of gas in their store rooms.

Mr. Faben—It brings it back to a question of "the survival of the fittest." In Mr. Starr's town he does not solicit trade for the electric light, but if a man comes to him and wants electric light, he does not refuse him. Now if incandescent lighting presents advantages over gas, people are going to perceive that, and they are going to adopt it. If a man has been solicited to buy a newspaper, or a book, or any other article, he may buy it because he is solicited to buy it, when its advantages have been presented to his notice; but, unless he wants it, he don't buy it another year; he can buy other things that will suit him better. Now, in the matter of electric light, in many towns where the price is made a contingent one of 75 cents or $1 or any other price per month, you take it and use it as much as you wish. How long do those people use those burners? They do not use them as long as they want them but they use them as long as they will burn. In our city incandescent lighting is sold at all prices. The trade is solicited very energetically and it has resulted in the adoption of incandescent lighting to a very great extent. If you were to go up our main street the brightest day you can imagine, you would not see a gas jet burning in a store, but you will notice very few incandescents turned out. They are all on, every one of them. I have in mind an instance of an office where they have two of them, and they burn them all day and all evening—if burned during proper hours his gas would certainly not cost him as much; and when asked why he used incandescent light there, he said: "Well, the incandescent light costs us a dollar, and it is arranged so I can turn on one or the other of them; but I was informed that if I put a piece of wire across here, both of them would burn. I put a wire across there and both of them burned, and as the electric light company don't say anything about it I get two of them for the price of one. When night comes I always light a gas jet, that is right over my desk there, and I let it burn also." Now, there are circumstances under which incandescent lights are almost indispensable, and are desirable; and whether, as Mr. Starr says, they solicit trade or not, those places where that light is more desirable than gas are going to use electric light; and where gas will answer the purpose just as well and cost less, gas is going to be used. People pay for style about so long and then they get back to a question of dollars and cents. It is the dollars we want from the people and not their gas bills.

In the Matter of Altering the Title of the Association.

The President—If no one else wants to make any remarks on this subject we will pass to the special order of business, referred to heretofore, namely, the question as to whether we shall submit to a vote of the Association the question of changing the name of the Association from "The Ohio Gas Light Association" to "The Ohio Gas and Electric Association."

Mr. Faben—As I understood the question before the Committee, a motion was made to have the Association vote on changing the name of the Association. The question of whether the Association should or should not vote on changing the name was referred to the Committee. The Committee, of course, had no arbitrary power in the premises, they merely decided that the Association be allowed to vote on the question of changing the name.

The President -The recommendation of the Executive Committee is, that the question of changing the name of the Association be

submitted to a vote of the Association; and now comes before us on a motion to adopt the recommendation of the Executive Committee.

After some further discussion as to the exact question before the Committee, Mr. Coverdale said:

I would like to ask if we can at this meeting change the name of our Association? Would we not have to alter the constitution in order to change the name?

The Secretary—With the permission of the Association, I will read the article of our constitution with reference to altering the constitution, which would have to be done in this case:

"All propositions for adding to or altering any of the provisions of the foregoing constitution, shall be laid before the Executive Committee, who may bring it before the next general meeting of the Association, if they think it fit, and such Committee shall be bound to do so on the requisition in writing of any five members of the Association."

Mr. Coverdale—It is evident that even if we decided to do so, we could not change the name to-day. You can make the proposition but it will have to go over until the next meeting and then vote upon, it; but you cannot do it to-day.

The Secretary—We can certainly vote upon the question to-day and then the Executive Committee can act upon it.

Mr. Coverdale—In regard to this matter, I would like to say a word. I haven't anything against the electric light business at all, because I am connected with it. We run an electric light plant; but I have some little pride in this Ohio Gas Light Association. I was one of its first members, the same as I was of the Western Association. It was pretty up-hill business when we started, but we believed that the gas interests of the State of Ohio needed an organization of this kind. Now, we have never objected to taking any member into this Association that had any connection with the gas interests. We have had members elected here who are supplying all kinds of materials and are interested in the manufacturing of articles pertaining to our business. I do not care how many members you take in of that kind, but now you propose to go outside of that entirely and take in something that was not anticipated at the time we formed this organization; and I did not know that it ever was anticipated until I heard it broached yesterday. I never had any idea that we desired another business to be represented and included in the Ohio Gas Light Association. The electric business is entirely outside, and has nothing at all to do with our gas interests—not a particle; and all members who are running electric light plants can come to our meeting, can read and hear read the papers and discuss the electric business in connection with our business. We can do all these things now; but just as sure as you decide to connect the electric light business with the gas business in this Association, then you open the door for electric discussions, and instead of having a two days' session you will have three or four days' session on that business alone, because it is growing. Now, just let us stick to the old thing; let us stick to the gas Association. It is good enough for us. It has been good enough in the past, and I think it is good enough in the future. We members will take care of the electric business, where it is to our interest to do it; and there is not a member of this Association that is interested at all in the electric light business but will be very glad to give his experience to all members of this Association. We will get just as much information from people who are engaged in it, as we should if we were to open the door to a great number of men that are interested entirely in the electric business and not interested at all in the gas business. Now, that is the objection I have to changing the name of our Association. The name is good enough. We will take care of our gas interests and we will take care of the electric light interests. [Applause.]

Mr. Faben—If it is in order, I move that the question as to whether this change of name shall be referred to the Executive Committee, to report on a year later, be voted upon by the Association now.

A Member—I second the motion.

The President—The motion is that the question as to whether it shall be submitted to the Executive Committee for their report a year from now, be voted on by the Association. I will remark that it don't have to be so voted on.

Mr. Faben—I make the motion that the matter be submitted to a vote of the Association, as to whether the question shall be referred o the Executive Committee, to report on a year later.

A Member—I move to amend the original motion. I move that the matter be laid on the table indefinitely.

Mr. Tayler—I second the motion that it be laid on the table, or under the table, and disposed of now.

The President—The motion, as amended, is, that the matter be laid upon the table indefinitely. [Adopted.]

The President—It does not seem that the members of this Convention are willing to change the name of our Association. I do not think we would have many married men here to-day if they had always held to that opinion in the case of their wives' changing their names. I do not think there is anything very harmful in the change of the name. We would have the same character of membership, and would proceed in the same way as we are doing now.

Mr. Faben—If a plan were submitted in connection with this matter as to who would be eligible and who not eligible, and as to what position certain men would occupy, whether active or associate members, we could understand the thing better; but as it is, it is entirely at random as presented here, and the Association could not vote intelligently on the subject. In talking with the members about this matter I made sure that a very large majority of the entire membership is opposed to changing the name at all. It is good enough as it is. It represents the business that we came here to represent.

The President—The next thing in order is a paper by Mr. Chas. H. Evans, of Jackson, Mich.

Mr. Evans then read the following paper on

FUEL GAS: RESULTS OF EXPERIENCE IN ITS MANUFACTURE, DISTRIBUTION AND USE.

All combustible gases have a right to the title of fuel gas, but few have a right to enter the field of gaseous fuel in competition with coal; and even the few can at present encroach but a part of the way on the domain of "old king coal." Of course, I refer to manufactured gases.

Nov. 10, 1883, non-carburetted water gas was introduced to the public at Lynn, Mass., as a solution of the fuel problem, and it fell to my lot to assist in the manufacture of the first strictly fuel gas for general distribution in this country. Its advent was characterized by the usual flourish that accompanies the introduction of a new thing, and much was promised—in fact, too much; for long before the works were in operation people were led to believe that fuel water gas at 50 cents per 1000 cu. ft. would be much cheaper to burn than anthracite coal at $6 per ton. Theoretically such would be the case, provided that coal be allowed to stand on the same plane it occupied 25 years ago, and no allowance be made for improved appliances for burning coal; and such seems to be the disposition of most who figure from a theoretical standpoint. Many offices and business places were taken by contract to heat, at prices corresponding with previous seasons' coal bill, while others paid meter rates. It was deemed unnecessary to purify the gas, as all heating stoves and furnaces would be connected to chimneys, and the expense would be needless. Consumers were not lacking, for the people hastened to avail themselves of the promised cheap and clean fuel. The growth of business was marvelous, reaching an output of 250,000 cu. ft. in about three weeks; but long before that time it was apparent that something was wrong. The amount of space heated did not meet the theoretical values figured out for the gas as compared with coal; and, to add to this, bad odors escaped from the products of combustion into the rooms heated, making life miserable to the consumers and as bad for the management of the company. Every possible effort was made to prevent the sulphurous odors escaping, and to carry them safely to the chimney; and this was no small task, for the products are heavy and the slightest crevice or imperfection in a stove would make the atmosphere of a room unbearable. When this trouble was overcome new ones arose to take its place.

In order to utilize the units of heat carried off in the products of combustion, long stove pipes, or dampers in the shorter ones, were used, and with a most damaging effect to both pipes and stoves. The moisture from the combustion of the hydrogen oxidized the sulphurous acid into sulphuric acid, which was most effective in its work, eating its way through the stove pipes, and, in many cases, utterly destroying the stoves; and this, too, in so short a time as seven or eight weeks. The work of the sulphur did not cease at the stoves, but was equally as bad on the gas engines using the gas. The slide valves were, in short time, cut and creased by its action, causing constant trouble and repair, and the cylinders in time suffered seriously. The pipes received their share of the sulphur, but by a different action; the first effect being the absorption of the sulphur by the new iron, and then a gradual deposit in sufficient quantities to clog the flow of gas in small pipes leading to the stoves, etc. I am most emphatic in my denouncement of unpurified gas, and trust that none of the members of the Ohio Association will have to suffer the experience that I did. Notwithstanding all the drawbacks mentioned, consumers were loath to give up the gas, but were gradually compelled to, dropping off the list, one by one, until the output had reached but 10,000 cu. ft. per day. At this time the President of the company was prevailed upon to put in purifiers, and from that time forward the progress was upward, but slow, as prejudices had been created that were hard to overcome, and 50 cents per 1,000 cu. ft. could not compete with coal for heating.

So far, my arguments have been rather against, than in favor of,

fuel gas; but I simply state the facts as they exist to erase any desire on the part of some of our gas friends to go into the supply of unpurified fuel gas.

In Jackson, Mich., fuel gas began its career in a quiet way, Dec. 21, 1887, claiming only what could be demonstrated, and placing the price of gas at 30 cents per 1,000 cu. ft. within the reach of all.

Prejudices existed which were fostered by our competitors, but gradually wore away under the pressure of convenience and comfort obtainable by the use of the gas. Our maximum daily output this winter reached 300,000 cu. ft. and bids fair to test the capacity of our present works—which is half a million cu. ft. per day—before the summer is over.

I will touch lightly on the process we have in use, as I do not wish to make my paper an advertising medium. Bituminous coal slack is charged into retorts, as in the manufacture of coal gas, crude oil being used in the furnaces to carbonize the coal. The furnaces are constructed with a view of obtaining as perfect a combustion of the oil as is possible, and require 23 gallons of crude oil, costing 1¼ cents per gallon, per ton of slack carbonized. The coke is drawn from the retorts through chutes direct into the generators, losing but a small portion of its heat in its passage, necessitating the use of the blast but a short time to bring the fuel to the required heat for decomposition of the steam. In the blasting up process the producer gases are utilized to generate steam, and the heat contained in the gas after leaving the generator is also used for the same purpose, both gases passing through a specially constructed boiler. This reduces the extra coal required for steam to 5½ lbs. per 1,000 cu. ft. of gas made. The average total product received from a ton of coal is 96 lbs. of coal tar, worth 50 cents, in Jackson, and 36,000 cu. ft. of mixed coal and water gas. This includes coal used for generating steam.

Iron sponge is used for purification, and is handled by conveyors in emptying boxes; the material being carried to the floor above and deposited for revivification. The purifiers are refilled through chutes over each box. By this method the cost of purification is reduced to a figure not reached by many companies.

The composition of the mixed gases obtained is about: Hydrogen, 52.39; carbonic oxide, 36.31; marsh gas, 8.51; olefiant gas, .5; carbonic acid, .62; nitrogen, 1.54; oxygen, .13. It has a theoretical calorific value of 402 heat units, and an actual practical value of 320 heat units per cu. ft. Theoretically, 18-candle power coal gas would be vastly superior to the above mixture, but, practically, on the best illuminating gas stoves in the market to-day, but 420 heat units are to be obtained, and then only by careful manipulation. This, then, would necessitate the selling of coal gas at 40 cents per 1,000 cu. ft. to equal, in effect, the mixed gas at 30 cents.

A cheap process of manufacturing gas is not all that is required for the success of a fuel gas company. Appliances for its use are necessary—appliances to take the place of any fixtures now using solid fuels, that are simple in construction, yet durable, combining beauty with cheapness, and, above all, constructed to allow of a perfect combustion and utilization of the gas. I believe it to be a mistaken idea that it is necessary to adapt the coal furnaces, stoves, etc., to the use of gas.

For forty years the manufacturers of coal stoves and furnaces have been trying to perfect their goods to consume coal, and get the the best results. Why should we attempt to burn a gaseous fuel in competition with a solid, and use the very instrument that makes our competition a close one and retards our progress?

Let us see how mixed gas at 30 cents will compare with anthracite at $6.00 per ton for heating purposes. Assuming the coal to have a calorific value of 13,000 heat units per lb., and burning it in the best constructed furnace of the day, which realizes 20 per cent. of the fuel used—the equivalent of the unit of heat in warming air is 52.5 cu. ft., raised one degree Fahr.

Assuming a store-room to contain 20,000 cu. ft. of air, and that the entire air be changed every hour, and that the temperature be raised from 20°—an average winter's day—to 70°, it would require in round numbers 457,200 heat units, or 1,428 cu. ft. of gas each 24 hours; this at 30 cents per 1,000—$42\frac{84}{100}$, or $12.85 per month of 30 days. Anthracite coal to accomplish the same results in heating would require 176 lbs. per 24 hours, or $52\frac{8}{10}$ cents, or $15.80 per month, a saving of 18 per cent. in favor of gas, as well as the saving of labor in handling coal. In the generation of steam, when cheap coal can be used, and a fireman supplies the coal under the boiler in proper quantities at proper intervals, the result would be much in favor of the coal. For instance, it requires to vaporize one lb. of water from 50° Fahr. to steam, 1,128 units of heat. The evaporation of 8 lbs. of water per lb. of coal is readily obtained with a good boiler, and would mean a utilization of 70 per cent. of theoretical heat units of the coal. On an evaporation of 8 tons of water it would require 2,000 lbs. of coal, or $2.50 for fuel, if it be of good quality. Let us see how near gas at 30 cents per thousand cu. ft. can approach this. To vaporize 8 lbs. of water would require 28 cu. ft. of gas, and to evaporate 8 tons it would be necessary to consume 56,000 cu. ft., or $16.80 for gas.

In this, of course, I have not figured in the labor for firing the boiler; but even then the cost of fuel gas at 30 cents per 1,000 would place it practically out of the field in competition with cheap coal for generating steam in large quantities. But this difference *can* be overcome, if the manufacturer will put in a private gas generating apparatus; for he will be able to produce gas at a price that will materially change the figures quoted in favor of gas.

But fuel gas has an enormous field outside of the generation of steam, and in this it has met with marked success at Jackson. Four hundred and fifty families are using it for cooking, heating and lighting, and 50 stores and business places for lighting and heating. The heating is not confined to small rooms and offices; large stores and even churches can, and are being heated at a cost satisfactory to the consumers. For the production of power, by the use of the gas engine fuel gas has a field that no competition can undermine. Small manufacturers will not be obliged to put in a boiler and engine, hire an engineer, and pay extra rates of insurance on their goods on account of having a boiler in the establishment. Or in lieu of this he might locate near a large manufacturer and hire his power, but that would mean to locate in a quarter of the city where high rents are demanded. With the gas engine he may run his business on any street where the companies' mains are, and receive his power at a total expense, for gas, oil and water, of 1¼ cts. per hour per horse power.

One point I have not touched on, and that is the necessity of a cheap and yet good light to complete the system. With the use of an incandescent gas burner one set of mains answers for all purposes. The Fahnehjelm burner, as used in Jackson, is, so far, meeting the requirement. It gives a steady, white, soft, yet penetrating light, and for amount of light obtained is cheaper than kerosene oil at 5 cents per gallon. We have 4,000 in use, giving good satisfaction to all, and each day shows a gradual increase, with a corresponding diminution of the coal gas and electric lighting. For 15 months this light has been in use in our city, and has established for itself a commercial success not attained by any other incandescent gas burner in the market to-day. It combines the three principal elements requisite for success, namely: Candle power and quality of light, durability and cheapness.

Fuel gas is but a boy, though a strong and sturdy one. It has passed the dangerous period of early life and gives promise of becoming a leader. It needs the teachings and advice of its parents, the gas fraternity. Will you extend that helping hand, and reap an early reward by increasing your field of business twenty-fold, or will you cast it aside as illegitimate, and defer, for the time being, what is sure to come—the general adoption of fuel gas?

Discussion.

Mr. Printz—I think Mr. Evans certainly deserves our sincere thanks for his kindness in preparing and reading to us this paper; I, therefore, move that a vote of thanks be tendered to him for his very interesting paper. [Adopted.]

Mr. Printz—I would like to ask Mr. Evans a question or two. In the estimate he made as to the comparison of cost of fuel gas and coal (which comparison he made with hard coal), whether he has made a similar comparison or estimate between gas at 30 cents and soft coal at anywhere from $1.75 to $3 per ton? Again, he spoke of the Fahnehjelm burner. I would like to ask how often it is necessary to renew the combs on those burners, and about what it costs per thousand feet for renewals?

Mr. Evans—Yes, I have made some experiments in the use of soft coal, but I believe it is generally acknowledged that soft coal heat is not worth one-half what anthracite coal heat is; and the additional labor in handling it makes it further objectionable. So objectionable that gas people prefer in every instance to use the anthracite coal. The combs you spoke of require renewing once in a hundred hours. They would last much longer than that, but the method of lighting being somewhat new in its character, it is desired to have the light appear to the best possible advantage, and, like all other new things, it has to be shown to be an improvement without doubt.

Mr. Somerville—First, I would like to express my admiration of the paper just read. I am exceedingly glad to listen to such a paper. It is a start in the right direction, and I want to express my obligation to Mr. Evans for the trouble he has taken and the excellent suggestions given in the paper he has prepared. One question I would like to ask: How did he arrive at his estimate of the heat units per cubic foot of his gas? And another question is: I should like to know how much gas for domestic consumption a family will use per month for heating purposes? I am sorry I am obliged to go; I would like to discuss this subject nearly all the afternoon, but the train is going, and I am just waiting to hear these two inquiries answered before leaving.

Mr. Evans—The estimate of heat units is determined by the changing of the temperature of water and by the use of a government thermometer showing how many pounds had been raised so many degrees Fahrenheit; or, in other words, by raising a certain number of pounds of water a certain number of degrees Fahrenheit. The usual amount of gas among small or ordinary families used for cooking purposes is 6,000 feet per month. I have in mind at present one family who have a house of five rooms on the first floor and two rooms above, a small cottage with rooms of fair size. The upper rooms they do not heat, except to take the chill off occasionally by opening the doors below. The lower rooms are all heated by one gas stove. It seems impossible, and yet it is a fact. It is owing, without doubt, to the continuous application of heat. It is perfectly steady. This family does all its cooking by gas. They have not a pound of coal in the house, or a stick of wood. Their bills run, during the severest weather, from $8.50 to $8.75 per month. There was no dirt, smoke or dust from the fire, and the lady of the house said it saved her one-half the labor of housekeeping. I simply give that as an illustration of a small family in a cottage, and as showing that it is within the reach of the poorer class of people I also have in mind a store room, 125 feet deep by 28 feet in width, and 15 feet high, which is heated by a gas furnace; and they are

able to heat the store in the severest weather. The coldest mornings we have had, which have been some 6° below zero, they were able in 30 minutes to heat the store to a temperature of 70°, and heat it from that one register. When the proprietor goes home at night he shuts off the fire and feels perfectly safe in leaving his store, because there is no possibility of fire. He has taken off one-half his insurance on account of the safety and security of this method of heating, and would remove his insurance entirely if it were not for the danger from some of his neighbors who use coal.

A Member—I would like to ask Mr. Evans what the combs are sold for?

Mr. Evans—At three cents apiece.

A Member—What does that figure up per thousand?

Mr. Evans—Seven cents per thousand feet of gas.

A Member—Have you tried that fuel gas through the albocarbon system?

Mr. Evans—Yes, sir.

A Member—How does that compare?

Mr. Evans—The process of carbonizing the fuel gas is so slow that a person could hardly wait for his light. It takes from 20 to 30 minutes to get any illumination to amount to anything from it.

Mr. Booth—In the store you mentioned, about what does it cost per month?

Mr. Evans—The bills run from $8 to $15.15; that was the highest bill for any month.

Mr. Coombs—I would like to ask Mr. Evans if he has on his list of consumers any that use it simply for cooking purposes alone, without heating?

Mr. Evans—Yes, sir; a great many.

Mr. Coombs—And about how much does it cost them for a cooking stove?

Mr. Evans—It will run all the way from 16 cents to $2.50 a month. I refer to that 16 cents because a woman came into the office some time ago, and in accordance with the experience of all gas companies, to use a slang phrase, "kicked" on her bill, and said she would have the gas taken out, as she considered it entirely too expensive. I supposed that something had gone wrong, and on inquiring found that her bill was 20 cents with the rebate of 4 cents off, making her bill 16 cents for the month. [Laughter.]

Mr. Lindsley—I would like to say a word with reference to the practical value of hard and soft coal. I do not know how far Mr. Evans has gone into this thing, but a few years ago, perhaps four or five, so long ago that I do not recollect the date exactly, the Brush Electric Light Company made a series of experiments to determine the value of the various sorts of soft and anthracite coal, and the result was very surprising to most people who were in the habit of using fuel. Anthracite coal was shown by these experiments to be but a very little better than the bituminous coal. Of course, for domestic use there was considerable difference because of the dirt and soot, and all that sort of thing. That is a point in favor of the anthracite that is almost beyond estimate; but so far as the comparative value of the two coals was concerned, it was so slight as to be hardly worth mentioning. I regret I have not the exact figures to give, for they were very interesting.

Mr. Evans—Was that for use under boilers?

Mr. Lindsley—Yes, sir.

Mr. Evans—That changes the case entirely. Where bituminous coal is fed under a boiler the man stands there and feeds such quantities as will give almost perfect combustion. You will readily recognize that that is impossible in the use of soft coal for domestic purposes, where it is barely possible to utilize six per cent. of the value of the coal. As I stated in my paper I do not believe that fuel gas can compete with coal for the generation of steam.

The Secretary—I would like to ask Mr. Evans if fuel gas at Jackson is sold at 30 cents per thousand feet to all consumers, regardless of the amount consmued?

Mr. Evans—That is the net rate; 40 cents per thousand with a rebate of ten cents off, if paid before the tenth or fifteenth, making it 30 cents net for all purposes. There are no consumers, no matter how large, that have any rebate from that figure.

Mr. Printz—I would like to ask Mr. Evans what pressure he carries on his mains, and does he continue the same pressure day and night?

Mr. Evans—Yes, sir; we carry a pressure of 2.7 inches.

Mr. Printz—Is there any special kind of meter which you use, or do you use simply the ordinary meter, and what effect does this gas have on the meter?

Mr. Evans—It does not affect the meter any differently from illuminating gas. We are using the Harris, Griffin & Co. and the McDonald meters.

Mr. Printz—Do you use a larger sized meter than is used for illuminating gas?

Mr. Evans—The difference of gravity, of course, regulates that. The gravity of our gas is about 5.32, and compares with coal gas at 4.00.

Mr Printz—You would use a larger meter, then, generally?

Mr. Evans—We would use a larger meter for many reasons, principally because a larger volume of gas is used.

Mr. Printz—And for the same reason a larger main would be used, I suppose, for distribution?

Mr. Evans—I believe that in the distribution of fuel gas in the future, it will be distributed under pressure; that if a set of mains to-day costing $50,000 and gas is being distributed under 3 inches pressure, rather than duplicate that set of mains making it cost $100,000, put about $3 worth of sand on your holder and you can duplicate the capacity of your mains without doubling their value. I believe that a small governor will be used at each house on each service, the pressure being regulated at that point.

Mr. Bate—I would like to ask Mr. Evans if, in the use of Fahnehjelm combs, any inconvenience is noticed by the motion of air in the room blowing the blaze on one side or the other. If there is a draft of air in the room which wou'd have current enough to affect the light, would it blow the light out or blow it to one side, so as it would be extinguished?

Mr. Evans—No, sir; it is impossible for an individual to blow the light out.

Mr. Bate—I don't mean whether the light could be blown out, but whether the draft would blow the gas flame to one side or the other, so that the combs would for the moment chill off and lose their incandescence?

Mr. Evans—No; I was about to explain that. The flame is continuous, and when the comb arrives at a state of incandescence, it is impossible to blow out the gas light by reason of the so perfect combustion. It makes a rigid flame. In coal gas a little wave of air will blow it to one side and will affect the light very materially, but it takes a stronger draft of air to affect a light produced by this Fahnehjelm comb than it does to affect the flame of illuminating gas; and this is due to the fact that it requires so small an amount of oxygen for the perfect combustion of the gas. There is no hydrocarbon to decompose.

Mr. Bate—Does the chilling of these points, when you shut the gas off, cause them to break any, or reduce their length or size?

Mr. Evans—No, sir; I have taken an incandescent comb off while it was white clear to the ends, and, as quickly as possible, dropped it in a cup of water, and even that did not fracture it one particle.

Mr. Gwynne—You stated the price at which you sold this gas. Would you have any objection to state what it costs you to produce it; what it costs in the holder? We would like to know what profit there is in it.

Mr. Evans—It can be put in the holder for considerably less than ten cents a thousand. The matter of profit always depends on the salary of the officers and other matters that are regulated by companies differently.

Mr. Lindsley—I would like to inquire of Mr. Evans if he has used any other style of incandescent burner than the Fahnehjelm; and, if so, what the result is?

Mr. Evans—I have made some experiments with the Welsbach. I have not used them practically. I consider the expense too high and the burners too frail, and their life is not long enough to justify the expense entailed in maintaining them.

Mr. Booth—What is the quantity of condensation in that gas?

Mr. Evans—There is not a particle of condensation. It is impossible for it to condense. In our drips we find that it is barely possible to get sufficient condensation to start the pumps, although it has been tried four or five times this last season.

Mr. Booth—Then if you have 100,000 feet in your holder you can meter at 100,000 feet?

Mr. Evans—We have a set of steel mains, and, taking the registration of our meter as being accurate—although it is probably not quite accurate, as it is a little too small for our works—we do not show a leakage of as much as 1½ per cent.

Mr. Gwynne—You have a capacity, as I understand, of about one-half million feet per day. Would you have any objection to state about what that plant cost you?

Mr. Evans—It cost less than $150,000.

Mr. Gwynne—The entire plant?

Mr. Evans—The entire plant—mains, meters, services, stoves and in fact everything connected with it, real estate, buildings and all.

Mr. Gwynne—How many miles of mains have you?

Mr. Evans—We have a little over eleven miles.

A Member—Do you furnish stoves to these families?

Mr. Evans—We lease or sell heating stoves, as is desired, and we sell cooking stoves. We lease a heating stove at the rate of $4 a season for its use, which does not make it expensive. Of course we would much prefer to sell the stove than to lease it; but we have arrangements by which a consumer can buy a cooking stove and we will either sell or lease a heating stove. We manufacture our own stoves.

Mr. Gwynne—What is your holder capacity?

Mr. Evans—We have two holders, one small one of 10,000 feet; the other is 100,000.

Mr. Lindsley—I understood you to say Mr. Evans, that you used steel mains?

Mr. Evans—Yes, sir.

Mr. Lindsley—I would like to inquire what kind of joints you make?

Mr. Evans—Screw joints.

Mr. Lindsley—Just screwed together in the ordinary way?

Mr. Evans—Yes, sir.

Mr. Lindsley—I am asking this, perhaps, more for my personal information, but let me inquire what experience you have had as to the effect of expansion and contraction; or what provision do you make for that, if any?

Mr. Evans—We do not make any. We make it a point to lay the mains low enough to avoid any possible effect of expansion or contraction.

Mr. Lindsley—About how deep is it necessary for them to be laid in Jackson, in order to accomplish that?

Mr. Evans—Five feet.

Upon motion the Association adjourned until 1.30 P.M.

SECOND DAY—AFTERNOON SESSION.

The sessions of the Association were resumed at 1.30 P.M.

REPORT OF COMMITTEE ON MEMORIALS.

The President—We will now hear the report of the Committee on Memorials, which the Secretary will read.

Whereas, It has pleased an Almighty Providence to take from this Association, during the past year, by the hand of Death, three of its active members,

Resolved, That while we bow to the Divine decree, we cannot but lament that their places in our midst must remain vacant forevermore:

Resolved, That, while we mourn our loss of friends and associates, we recognize the far greater loss to those to whom our late associates were nearer and dearer, and that our heart sympathies go out to the home circles that feel most keenly the desolation of loss.

Resolved, That a memorial tribute be placed upon the minutes of this Association, to the memory of F. W. Day, John M. Murphy and M. C. Allison, and an attested copy of this minute sent to the families of our deceased members.

Committee { G. W. GRAEFF, L. M. BATE, R. T. COVERDALE.

Upon motion of Mr. Gwynne, the report was accepted and placed on file.

REPORT OF COMMITTEE ON NOMINATIONS.

The President—The Committee on Nominations submit the following report: *For President*, C. R. Faben, Jr., and Edward Lindsley; *Vice-President*, Geo. S. Harris and Joseph Gwynne; for *Secretary*, Irvin Butterworth and S. B. Cradit; *Treasurer*, H. Wilkiemeyer and W. W. Prichard.

ELECTION OF OFFICERS.

Mr. Printz—Mr. President, the Committee on Nominations did not know, at the time they made those nominations, that the place of our next meeting would be at Toledo. Mr. Faben in some way became aware that his name had been suggested for the position of President, and he asked that his name be withdrawn in favor of Mr. Lindsley. That being the case, I move that Mr. Lindsley be elected by acclamation as our President for the ensuing year.

The motion being seconded, was carried.

Mr. Lindsley was then called and spoke as follows:

Mr. President and Gentlemen—When one is taken utterly by surprise and happens to be utterly unable to make a response, he is in a bad fix; and I am in just that kind of a fix now. I would like to say some fitting words at this time, and had I the gift that some of my brothers here have, I would try to tell you just how I feel at this particular time. I can only say that I feel that the duties of this position ought to be carefully attended to, and that the success of the Association depends in some measure upon the ability with which the duties of the President are performed; but they depend very much more largely upon the support of the membership; and in approaching those duties I can only say to you that I shall desire your hearty co-operation so far as it may be necessary. I am sure you will give it, and I can only promise you that I will do the best I can for the success of the Association. I have had occasion to feel very kindly toward this Association in the years I have been connected with it. I appreciate it all, but I appreciate this last mark of esteem more deeply than I can find words to express. I can only say that I thank you, which I do from the bottom of my heart. [Applause].

The President—We had now better finish up voting for officers. The ballots are all prepared, and we will proceed at once to ballot for the remaining officers.

Mr. Gwynne—I wish to withdraw my name in favor of Mr. Harris. I have been Vice-President of the Association for one year, and I, therefore, respectfully decline re-nomination. I would prefer that the Association give its unanimous ballot for Mr. Harris.

Upon motion, Mr. Harris was elected Vice-President by acclamation.

Mr. Cradit—With due appreciation to the Nominating Committee for the honor conferred upon me, I will withdraw in favor of Mr. Butterworth, and move that he be elected by acclamation. [Adopted.]

INCREASING THE SECRETARY'S SALARY.

The President—This disposes of all the offices except the office of Treasurer; the candidates nominated are Mr. Wilkiemeyer and Mr. Prichard. I will appoint as tellers Messrs. Printz and Gwynne. Printed ballots will be found upon the Secretary's desk. While the tellers are gathering and counting the votes I would say that it has been suggested that the salary of our worthy Secretary be raised, in which suggestion I most heartily concur, and I would like some member to make a motion to that effect.

Mr. Gwynne—I move that the Secretary's salary be raised to $200 per year.

Mr. Strong—I second the motion. [Adopted.]

The Secretary—Mr. President, I am very much surprised. I have not solicited an increase in salary, and I did not know, until Mr. Wood just now made the suggestion, that such a thing was contemplated by any one. I appreciate your action very much, however, and shall try to earn the salary, with your co-operation. I hope that as the compensation has been increased the difficulty of obtaining papers will not be correspondingly increased. That is the only thing I am afraid of. I shall do my best. [Applause.]

The President—As soon as we have disposed of the matter of electing officers for the ensuing year there will be one more paper read. Then we have an invitation to visit the Mansfield Gas and Electric Light works and inspect their plant, and we are also invited to witness an exhibition of the Fire Department of this city. Upon adjournment we will go in a body down to the works and inspect them, in response to the kind invitation extended.

Mr. Gwynne—The vote on Treasurer stands, for Mr. Wilkiemeyer 27, for Mr. Prichard 10, giving Mr. Wilkiemeyer a majority of 17.

The President—Mr. Wilkiemeyer is elected Treasurer of this Association for the ensuing year.

Next in order will be a paper on the subject,

CRUDE OIL AS A FUEL UNDER BOILERS.

by Mr. J. W. Gwynne, Bucyrus, Ohio.

Mr. Gwynne not being present, the Secretary read to the Association the author's paper, which follows:

Never having seen a laboratory or a chemist and confessing ignorance of the mathematical problems by which the oracles demonstrate values by analysis, I only expect the attention of the less ambitious operatives, who show their skill in the gas and lighting factories, rather than in the columns of magazines, and who believe that an ounce of experience is worth 20 tons of theory. For 18 months our laboratory has been the fire-box, and our results are obtained by simple subtraction of bills payable from bills receivable, of gross cost from value of product.

We put aside chemistry and algebra, and fine decimals, and rely on 18 months' performance as the test of merit and worth. Measured by this standard, natural gas is King, and crude oil is the "Crown Prince."

Theoretically, 3 barrels of crude oil, of 42 gallons each, exceed the heating capacity of a ton of coal; but as a steam producer the trials are not so favorable to oil. The rival fuels used in the test were Ohio bituminous lump coal, against Lima crude oil. Each was used 31 consecutive nights, with conditions as nearly similar as possible. The consumption of coal was 65½ tons in the 31 nights, and of oil 251 barrels during the 31 nights following—showing that a little less than 4 barrels of oil had performed the work of a ton of coal.

Coal account for 31 days—65½ tons at $2.55, in stockhouse	$167.02
Oil account for 31 days—251 barrels at $0.52 in tank at works	130.50
Saving in favor of oil	$36.52

or nearly 22 per cent. less than coal.

A safe rule is, wherever and whenever 4 barrels of oil can be bought for less money than a ton of coal, the oil is the cheaper.

In round numbers, in 31 days' trial, at $2.55 for coal, and 52 cents for oil, the coal costs 10⅓ cents per light per night; the oil 8 1/10 cents per light per night.

Our coal is hauled from southern Ohio, 115 miles; the oil from Lima, 60 miles.

A second and shorter experiment was made to show the relative value of coal and oil, using each two nights, or an aggregate of 21 hours on coal and 21 hours on oil, and carrying all the time 52 arc lights of 2,000 candle power each, with atmospheric conditions the same. The result was:

Coal used in 21 hours . . . . . 8,724 pounds,
Oil " " " " . . . . . 702 gallons;

showing the practical equivalent of one barrel of oil to be 489 pounds of coal.

We use a Babcock & Wilcox boiler, 16 feet long, containing 42 flues of 4 inches diameter. The usual power required is 75 horse; and the usual steam 90 pounds.

Our burner is the Reed hydro-carbon. I leave the makers and venders of these mechanical contrivances to explain their construction and points of excellence.

Starting with a pressure of ten pounds of steam, we can easily raise it to 90 in 15 minutes; or, starting at 10, we raise it to 90 in 17 minutes, taking during the time one gauge of cold water. Carrying 90 pounds pressure, we evaporate 123 pounds of water to each gallon of oil used. One pound of oil evaporates 17 pounds of water. The temperature of feed water was usually 160 to 180 Fahrenheit.

Without choosing between rival boilers and burners, we make a suggestion as to applying the heat to all boilers, namely: The burner should be placed well forward, and the direct flame should not strike the boiler. One essential feature of all successful burners is, the full force of the steam must be carried to the extreme interior point of delivery, thereby securing higher and more uniform temperature, and geater regularity in consumption, combustion and heat.

Another important provision for promoting combustion is an abundant supply of hot air. Heat the air before it enters the fire-box. At the point of delivery it should not be less than 400° F., and higher if possible.

This is accomplished by the simple and inexpensive construction of fire-brick, or 6 inch tile flues, extending from the rear to the front of the boiler, along the floor of the ash-pit, thence returning

to the back wall of the ash-pit, thence to the front again and deliver near the point of the burner. This costs about $20, and occupies but limited space. The brick or title channels obtain a very high temperature, giving a constant breeze of hot air at the point required.

Before passing the question of economy, another important saving is to be remembered. No fireman is needed. In small plants this saves $500 per annum, and larger plants in proportion.

One man can easily take care of a battery of ten 100 horse power boilers. In small plants the engineer performs the work of both the engineer and stoker without difficulty. He holds the oil fire in perfect control, with the same ease and quickness as steam or water. With but slight attention he carries precisely the same pressure constantly, and, when his work is done, or in case of danger, he extinguishes his fire instantly, by turning a valve.

Dismissing economic points, we mention a few of its other advantages.

Oil need not be shoveled from the car to the cart, from the cart to the stock-house, and again to the boilers. Oil transports itself, and dumps itself into storage tanks at the works; is pumped up daily into a feed tank, on which is a registry of consumption; and from the feed tank it flows under the boiler in quantity regulated by the engineer.

Our oil is conveyed from the railroad tank cars to our iron tank at the works by a wooden pipe line. These storage tanks are outside the buildings; six feet away from the walls, and buried under two feet of ground. The daily supply is pumped from these storage tanks to a feed tank in the building, placed high enough to feed by gravity. The use of oil gives uniformity of steam pressure. The degree of heat can be nicely regulated. When the valve is once set to a proper supply it need not be touched for hours, and the hand on the steam gauge will stand as immovable as "a painted hand on a painted dial." It responds more promptly to the demand for steam than coal.

There is no opening of doors for the introduction of fuel; therefore, no fluctuation of heat, no sudden changes of steam pressure, no sudden chilling of flues and boilers. Electric owners and operatives know how essential this is to the production of steady light, and to the preservation of the boiler.

Cleanliness. Next to coal miners, the electric light and gas makers are the dirtiest and blackest of the sons of toil; but with oil fuel the boiler room can be kept as neat as the parlor, and the operatives as clean as dudes. Though the odor is not precisely the fragrance of the geranium, it is neither offensive nor unhealthy.

Your fire is clear, pure, white; without ashes, smoke, cinder or soot; nearly free from sulphur and other injurious substances; needs neither stirring nor encouragement, but burns as evenly as a gas jet, as hot as Africa, and safer than natural gas.

Petroleum. Cheap, portable, and effective, is the rising fuel.

Entertaining no doubt that our subsequent operations fully verified our 31 days' trial, the saving in fuel is over 21 per cent., and in labor, the wages of a stoker, to which is to be added the comfort of a clean boiler room, clean faces, clean clothes, quick, even steam, and pure, steady light.

Experiments are now going on for solidifying oil. The process consists of heating the oil and adding one to three per cent. of soap. The soap dissolves in the oil, and when cold has the appearance of cement and the hardness of compact tallow. It burns slowly, without smoke, and develops great heat. Thus solidified, and cast in blocks, its use on locomotives, lake and ocean vessels, in fact, wherever steam is needed, is perfectly practicable. Therefore, if we don't run out of soap, it will not be a surprise to see the industries of the world moved by "Soaped Oil."

Discussion.

The President—You have heard Mr. Gwynne's paper; what shall be done with it?

Mr. Alexander—I move, Mr. President, that a vote of thanks be tendered to Mr. Gwynne for the preparation of this paper. [Adopted.]

Mr. Lindsley—Mr. Gwynne is not here to answer any questions, as I understand, and in his paper he disclaims any purpose to give any names of the makers of the apparatus. I would like to know something about the kind of burner used, if any one here knows anything about it.

A Member—It is called the Reed hydro-carbon burner.

Mr. Lindsley—How many different makes of burners are there?

Mr. Shelton—I think I can give Mr. Lindsley some information on that subject. There are 23 different makes of burners on the market, so that Mr. Lindsley can have his choice. I was talked almost to death by a hydro-carbon burner man, yesterday, on the train; and had a very narrow escape. [Laughter.]

VOTES OF THANKS.

The President—I think it proper for a motion to be made that the hearty thanks of this Association be extended to the Mansfield Gas and Electric Light Company, and also to the officials and citizens of Mansfield for their hospitality and entertainment while in their city.

Mr. Cline—Mr. President, I move the adoption of that resolution. [Motion carried and resolution adopted.]

Mr. Printz—I move that a hearty vote of thanks be tendered to the retiring officers for the kindness, attention and care with which they have conducted the business of the Association for the last year.

Mr. Gwynne—I second the motion.

Mr. Printz then put the motion, to a rising vote, and declared it carried unanimously.

President Wood—As Ex-President I would thank you for this mark of esteem, and I feel that you will better yourselves next year with a new President.

Mr. Printz—Mr. President, one of our new members, an old gentleman long connected with the gas interests, has had some trouble with a leaky holder, and would like to know if any other member has had similar trouble, and if so what remedy could be applied?

Mr. Dillon—I am from West Virginia. I have charge of the Wheeling gas works, where a holder that was built some four years ago leaks considerably. I would like to know what the remedy is.

The President—I guess Mr. Coverdale can help you on that.

Mr. Coverdale—All I could do would be to scrape it well and paint the seams.

The President—If there is no further discussion, a motion to adjourn will be in order.

Upon motion, the Association then adjourned, to meet at Toledo, Ohio, on the third Wednesday in March, 1890.

Second Annual Meeting of the South Western Gas Association.

HELD AT AUSTIN, TEX., March 19, 1889.

The meeting was called to order at 10.30, A.M., by President Beck, of Galveston. A report of the Committee on By-Laws was called for. Mr. Russell, of Houston, reported that by-laws had been drafted. The report of the Committee was read, received and adopted by sections, and then adopted as a whole. The by-laws adopted are as follows:

SEC. 1. *Order of Business.*—Roll call; reading of minutes of previous meeting; reading of applications for membership; election of new members; president's address; report of secretary and treasurer; report of committees; election of officers; general business; reading of papers; adjournment.

SEC. 2. *Dues and Fees.*—The initiation fee shall be three dollars; annual dues, two dollars; special assessments, when necessary, may be made by consent of two-thirds of the members present, and shall be limited in amount to the sum of five dollars to each member.

SEC. 3. *Notice of Meetings.*—It shall be the duty of the secretary to mail notices of meetings at least thirty days before the date of such meetings, and also have same published in one or more gas journals, six weeks prior to said meeting.

SEC. 4. *Election of Members.*—Candidates for admission shall be proposed by two members, said proposal to be accompanied by the initiation fee, at any meeting of the Association, and if found eligible, shall be balloted for, and, upon receiving a two-thirds vote, shall be declared elected members of the Association.

SEC. 5. *Resignation of Members.*—Any member whose dues and assesments have been fully paid may withdraw from the Association, by tendering a written resignation.

SEC. 6. *Expulsion of Members.*—Upon the written request of five members, that, for cause stated, any member be expelled, the president shall appoint a committee of three to investigate the charges against said member, and, upon report of said committee, shall submit same to the consideration of the assembled members. A two-thirds vote of all the members present shall be necessary for expulsion. A non-payment of dues or assessments for a longer period than one year shall be considered sufficient cause for dropping the name of any member from the rolls of the Association, provided said member has been served with three weeks' notice of his delinquency, during which time he may discharge his obligations and have his name continued on the roll.

SEC. 7. *Amendments.*—These by-laws may be amended at any regular meeting of the Association by a two-thirds vote of all the members present.

On motion of Mr. Enfield, the following telegram was sent to Mr. Irvin Butterworth, Secretary of the Ohio Gas Light Association, at Mansfield, O.:

"The South-Western Gas Association in session assembled greets its older brother, the Ohio Gas Light Association, with fraternal feelings and wishes it a prosperous meeting." In response to which the Secretary received, on the following day, this reply: "To Thos.

D. Miller, Secretary South Western Gas Association, Austin, Tex. The Ohio Gas Light Association in convention assembled, acknowledges with satisfaction the fraternal greeting of its younger brother, the South Western Gas Association, which greeting is cordially returned with its best wishes for a long and useful life.—IRVIN BUTTERWORTH, Secretary."

The roll was then called, six members responding as follows: Messrs. Beck, of Galveston; Russell, of Houston; Mason, of Waco; Judge, of Austin; Enfield, of Dallas; Miller, of Fort Worth. The minutes of previous meeting were read and approved. Applications for membership—from Messrs. Henry Roach, Gen. Mgr., San Antonio Gas Company; E. A. West, Supt. San Antonio Gas Company; and J. B. Smallwood, Maryland Meter and Manufacturing Company, Balt., Md.—were received and parties balloted for resulting in their being elected members of the Association. On motion, the order of business was suspended to amend the Constitution. Article IV. of the Constitution was then amended so as to read as follows:

Membership.—Membership shall be confined to active members. Any superintendent, gas engineer or any one engaged in the active management of gas works may become members of the Association, under the provisions of the by-laws.

Article VII. was then stricken out. President Beck then read the following address:

ADDRESS OF PRESIDENT.

Gentlemen of the South Western Gas Association:—On the 20th of last August, a limited number of gas works were represented by their Superintendents at a meeting in Galveston. At that time applications for membership and correspondence of a promising nature made the members present hope that the next meeting would realize an Association combining representatives of all gas works; in fact of any gas works interested in such meetings. By a notice of our Secretary, published in the AMERICAN GAS LIGHT JOURNAL, an invitation was extended for this purpose, and I am glad to say that a fair response has been the result. Our first attention ought to be given to proper organization, to amend the constitution and adopt by-laws; then the principal time of our meeting will be occupied by the reading of papers on subjects selected by members, with an exchange of opinions upon the contents. To finish our labors, enquiries on topics concerning our vocation will be in order; and I hope that every one of us will go home satisfied, carrying away some new idea for his own benefit, and the company he represents. Since our last meeting, I presume that every one of us has had ample reason to enquire into the merits of electric lighting, to compare prices charged for incandescent lights with the rates offered by gas companies for gas. It is natural that our investigation would first commence by finding out, for instance, the cost to produce a light equal to 16,000 candles by 1,000 incandescent lamps. To me it was allotted to read a paper at our last meeting upon this subject. Simple as the question sounds, permit me to state that to give in reliable figures the cost is a task wherein the number of factors to be considered are so numerous that I did not feel justified in giving the result of my calculations, claiming, as I do, that statements of cost must be such that they cannot be questioned, otherwise they are deceptive and worthless; hence I could not comply with your wishes. The reasons for this uncertainty in the cost of production are, the great diversity in the amount of fuel used per horse power, the life of an incandescent lamp, depending upon its quality and use, and the great variation of the number of lamps per horse power with the number the dynamo supplies. In cases, as in our station, where the motive power is transmitted by one countershaft to all arc and incandescent light dynamos in operation, conclusions in regard to cost can only be reached by monthly or annual balance sheets, showing profit or loss. Surrounded by all the tempting offers from manufacturers of electrical appliances, any information on this point, and the general knowledge of electric lighting, will be welcome to us all.

Much has been written on the erection of an electric light plant in connection with gas works. Some claim that the only salvation for gas companies is to adopt this plan, others deem it not necessary, claiming that cheap and good gas will hold its ground against competition. I think that, first of all, it requires a full knowledge of the wants of a city, and the course to be followed can only be planned after carefully considering local conditions. However, it is safe to say that in most cases gas companies are the best prepared to conduct this branch of lighting, in connection with their existing gas plant. An exhaustive discussion upon this subject would be very valuable, as some of us might be called upon to give an opinion, and with your decision carefully considered would rest the future prosperity of the works under your charge. Gentlemen, our position, as managers of gas works in connection with electric light plants, or for the purpose of furnishing gas alone, requires our untiring watchfulness. We have to try to reduce the cost of the manufacture and distribution of gas to the lowest figure, so as to be able to increase our consumption, which can only be done by making all possible concessions. The public, being stimulated, as it were, with offers from competing companies, will not rest in their demands for reductions. Everything is too high, and I think that any price offered at present would not satisfy. Rest assured that this state of dissatisfaction will regulate itself, in the course of time. The indications are that central electric light stations in many cities find their rates too low, and in some cities an increase of rates has already been the result. It will be but a question of time, when, to make a fair profit on furnishing electric light, higher rates have to be adopted, thus giving gas the position of a competitor upon an equal basis. The numerical success in patrons of electric light companies was achieved by the low rates offered. Capitalists lavished capital upon the "light of the future," expecting in return immense revenues. To-day more careful investigations are made before they part with their money. They want better guarantees than the promises of enormous profits. They learn, slowly, but surely, that the manufacturers of the different electrical machinery used make the harvest; the company interested in furnishing the light can fight for a living. Electric light will stay, but the price for it will be increased. There is an end to the purse of every philanthropist. These comparatively free exhibitions of electric lighting will stop in many cities and will reopen the same day on business principles. Gentlemen, to promote by combined practical experience, the interests of the companies we represent has been one of the causes for which this Association has been formed. To improve our individual knowledge in the science of gas making; to distribute the same successfully, another. We have ample material on hand to occupy us all the time we feel inclined to devote to our mission, and it is not my intention to shorten your valuable moments by going over the field of interesting points which would prove a source of profitable discussion. In conclusion permit me to ask your indulgence in regard to my address to you. Rest assured that my sincere wish is to see the South Western Gas Association properly organized with a large membership of practical men, and of benefit to each member and to the gas companies who entrust us with the management of their business.

Gentlemen, I thank you for your kind attention.

A vote of thanks was awarded to the President.

The Secretary and Treasurer then made an oral report, which was received with thanks. The election for officers (from nominations made by a committee composed of Messrs. Roach and Miller) resulted as follows:

President.—Wm. Enfield, of Dallas.

Vice-President.—A. E. Judge, Austin.

Sec. and Treas.—C. P. Russell, Houston.

On motion, Mr. Beck was elected, *ex officio*, Vice-President. On motion, a question box was placed in position, and the Association adjourned to reconvene at 3 P.M. On reassembling, Mr. Judge read a short and explicit paper on a "Method of Burning Coal Tar." A very spirited discussion ensued. A general discussion then came up, and was extended until a late hour. On motion, it was decided to hold the next annual meeting at Dallas, Tex., on the third Tuesday and Wednesday, March, 1890. The new officers were then installed. A vote of thanks was extended the retiring officers, and also to Mr. Judge for his entertainment.

Adjourned.

THOS. D. MILLER,
Secretary.

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MONDAY, APRIL 8, 1889.

The Light of Shooting Stars.

M. Cornu, in a paper to the Academy of Sciences, gave it as his belief that the light emitted by shooting stars is not due to conflagration or to the heat of impact. In those high regions our atmosphere is too unsubstantial to render the explanation acceptable. It is much more likely the phenomenon is one of static electricity developed by simple friction, and it is well known that rarefied gases can be made to glow intensely with but very little electric fluid.

New Method of Inserting Storage Batteries in Cars.

The usual method of placing the storage batteries in position beneath the seats and removing them is from the side of the car, and to admit of doing so the sides or panels of the car between the top of the seat and the sill pieces are loosely connected or hinged to the car body frame so as to be removable from the car or dropped down out of the way, and the batteries are lifted into and out of the car. To admit of placing the batteries beneath the seats, however, the vertical and angular braces heretofore used between the posts of the car body frame must be cut away or dispensed with, or otherwise the batteries cannot be placed in position beneath the seats; hence, it is said, the car body is weakened at its parts requiring the greatest strength, and when so weakened it has to support and carry the large additional dead weight of the storage batteries. Consequently, if the car be a street car with the wheels in the center, it is not as strong and durable as the usual form of the same, and, on the other hand, if it have trucks at the end to distribute the load the body is not properly braced and it sags in the middle, and it is not, therefore, as strong and durable as before.

To obviate these difficulties Mr. John A. Brill, the well-known car builder of Philadelphia, proposes, according to the *Electrical World*, to place the batteries in position under the seat and remove the same from the end of the car. A door is made in one of the ends of the car adjacent to the seat and also a door or flap in the dasher in line with the door in the end of the car. There are also provided rollers or wheels in the car floor below the seats for a tracked platform, upon which the battery sections, properly coupled together, are placed, so that all the battery sections for one side of the car can be run under the seat at once, and at their far end circuit connections are so arranged that they automatically couple with and uncouple from the motor circuit when the battery is inserted into and withdrawn from its position beneath the seats.

Petroleum Borings in Galicia.

Considerable stir has been excited lately in Austria by the success of the petroleum borings in Galicia, and hopes are entertained that at no distant date the Austro Hungarian empire will be totally independent of a foreign supply of oil. Formerly there was a tendency to speak slightingly of Galicia oil deposits, but this was due to the fact that a large proportion of the wells were dug by hand under conditions of the most primitive character, preventing all possibility of a very large yield. Of late years, however, the Canadian method of drilling has been introduced, and many Galicians have become accomplished drillers. Thanks to this, and the abundance of technical and geological talent in Austria, some striking successes have been achieved; and in one particular district, the Lodyna, wells of a most profitable character have been bored. Galician wells, in general, have not the copiousness of Russian, but a readier market exists for the oil, and the demand for Lodyna petroleum is such that the production of the wells is sold at a high rate long in advance of appearing on the surface. The oil belt of Lodyna is five miles long and intersected by a railway, thereby enabling the oil to be sent to the refineries at a trifling expense. A few years ago all the refineries in Galicia did not produce between them a million gallons of refined oil. Their production now exceeds six millon gallons, and is expected to be doubled in another couple of years. Owing to the broken and inclined character of the strata of Galicia, the American system of boring by ropes is not suitable to the country, and the Galician people, like the Indian authorities, have had to turn to Canada for drillers. The American system, pure and simple, was found to be equally inapplicable at Baku, and rods instead of ropes are in general use there. The Austrian Government takes a great interest in the development of the petroleum industry, and has adopted a protective policy which has already succeeded in establishing the Galician oil trade on a firm basis. Thanks to this and to such successes at the recent borings at Lodyna, where wells have been struck giving a profit of 500 or 600 per cent., the financial and commercial world in Austria has been deeply moved, and petroleum has caused as much excitement as South African gold in this country. The extension of the railway system in Galicia penetrating the petroleum region in various directions, and connecting it with the European network, enlarges and improves every year the market, and promises to render in time the oil industry as important for Austria as it is for the United States.

The Market for Gas Securities.

Consolidated at close of the week shared in the buoyancy of the general market, while it yielded less to the depression that ushered in the week than anything else on the list. To day (April 5, noon) it is at 83¼. Other city shares show no change. In Brooklyn shares there is nothing of especial interest, although all classes are strong and steadily held. Metropolitan seems to us to be good for 95, prior to October. At city auction we note the following transactions: 430 Consolidated, at 82⅝; 50 Williamsburgh, at 118; 100, same Company, 122¼. These are probably a portion of the Willets holdings. The events of the week are the offer of $140 per share for control in the Laclede Company, of St. Louis, Mo.; and there is no doubt but that the bargain will be closed. It is said that the Vanderbilts, of New York, and the Lairds, of London, are furnishing the money; but whoever the principals are, it may be taken for granted that the entire gas supply of the city has been bargained for. Now for a division *a la* Chicago This proves that those who held on to Laclede stock are to be repaid for their tenacity. Did we hold any Laclede we should refuse to part with it, even at $140. It is easily worth 175 for combination purposes.

The other surprise is the virtual control secured by the operators of the Troy fuel gas works in the old Troy Gas Light Company. We do not know the price paid; but it must have been a steep one. It is a most valuable property and its proprietors ought to have had no trouble in holding their ground against any and all opposition. The Newark Company has declared a dividend of 2½ per cent. Western values are unsettled because of the uncertainty attending the strength back of the parties behind the fuel gas raids. These ordinances are virtually permissions to engage in the distribution of illuminating gas.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.
16 WALL ST., NEW YORK CITY.

APRIL 8.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	83¼	—
Central	466,000	50	—	—
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	115	117
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	98	100
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	90	100
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	103	104
Citizens	1,300,000	20	60	70
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	123	125
" Bonds	300,000		—	106
Peoples	1,000,000	10	71	73
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	88	90

Nassau	1,000,000	25	111	—
" Ctfs	700,000	1000	100	103
Williamsburgh	1,000,000	50	119	122
" Bonds	1,000,000	—	109	112
Out of Town Gas Companies.				
Boston (Mass.) Gas Co	2,500,000	500	240	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	—	—
" " Bonds.	45,000	—	-	—
Chicago Gas Trust	25,000,000	100	48½	48¾
Cincinnati G. & C. Co.	6,000,000	100	205	207
Consumers Toronto	1,000,000	50	192	—
Central, S. F., Cal.			75	90
Capital, Sacramento, Cal.			58	—
Consolidated, Balt.	11,000,000	100	45⅛	45½
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	110	—
Jersey City	750,000	20	165	170
Laclede, St. Louis, Mo.	2,000,000	100	—	115
Louisville, Ky.	2,570,000	50	125	130
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	204	210
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds.	240,000	100	103	—
New Haven, Conn		25	193	197

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PHILADELPHIA, PA.
It is to the interest of Gas Companies and Cities to double the efficiency of the light on streets by using Dyott's Patent "CHAMPION" LAMPS. They save 50 per cent. over others in cost of repairs, are ornamental, and indestructible except by violence.
Our Patent System of Instantaneously Lighting Gas (without electricity), for Railroad Depots is unequaled.
Dyott's High Candle Power Burner is a very superior lamp where a concentrated and brilliant light is wanted in Hotels, Stores, Depots, etc.
Special Drawings furnished and Estimates cheerfully given, either from Architects', Engineers', or our Draughtmen's Plans.
We manufacture every description of Plain and Ornamental Lamps, Posts, Brackets, Clusters, etc. Correspondence solicited.

THE BRENNER SELF-SEALING RETORT DOOR.
Simple, Strong, and Durable.
CLOSES ABSOLUTELY TIGHT, & IS LOCKED BY A CAM LEVER. ALL NECESSARY ADJUSTMENT FOR WEAR PROVIDED.
BUILT BY
SMITH & SAYRE MFG. CO.,
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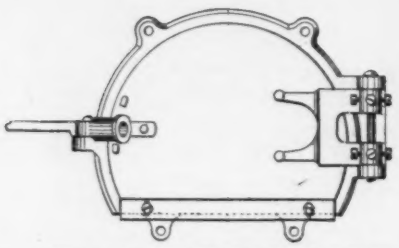
Brenner Self-Closing Retort Door.

WILLIAM B. LUNDIE, Superintendent of the 42d Street Station of the Consolidated Gas Company, of New York, writes, under date of Jan. 4, 1889:
"We have 320 Brenner Self-Sealing Lids in use at this Station, built by the Smith & Sayre Mfg. Co. They require very little attention, and are the best of the kind that I have seen, giving entire satisfaction."

Gasholder Tanks & Gas Works Masonry Complete.
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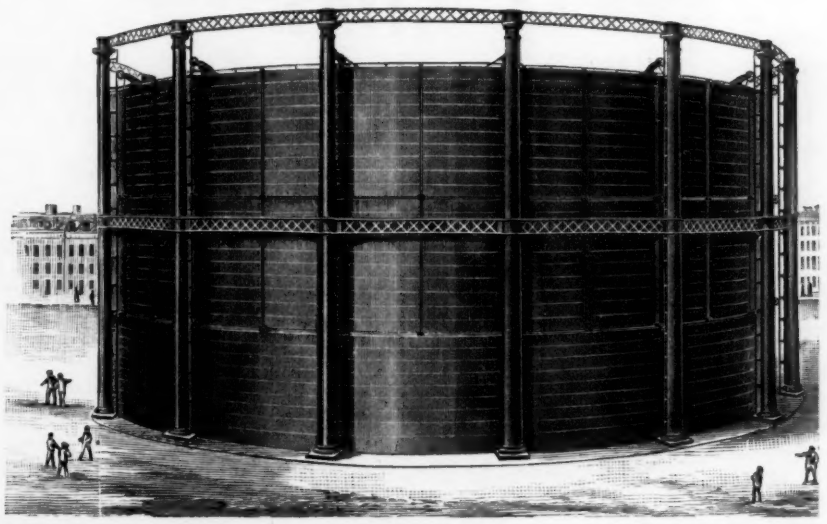

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HAZELTON BOILERS.

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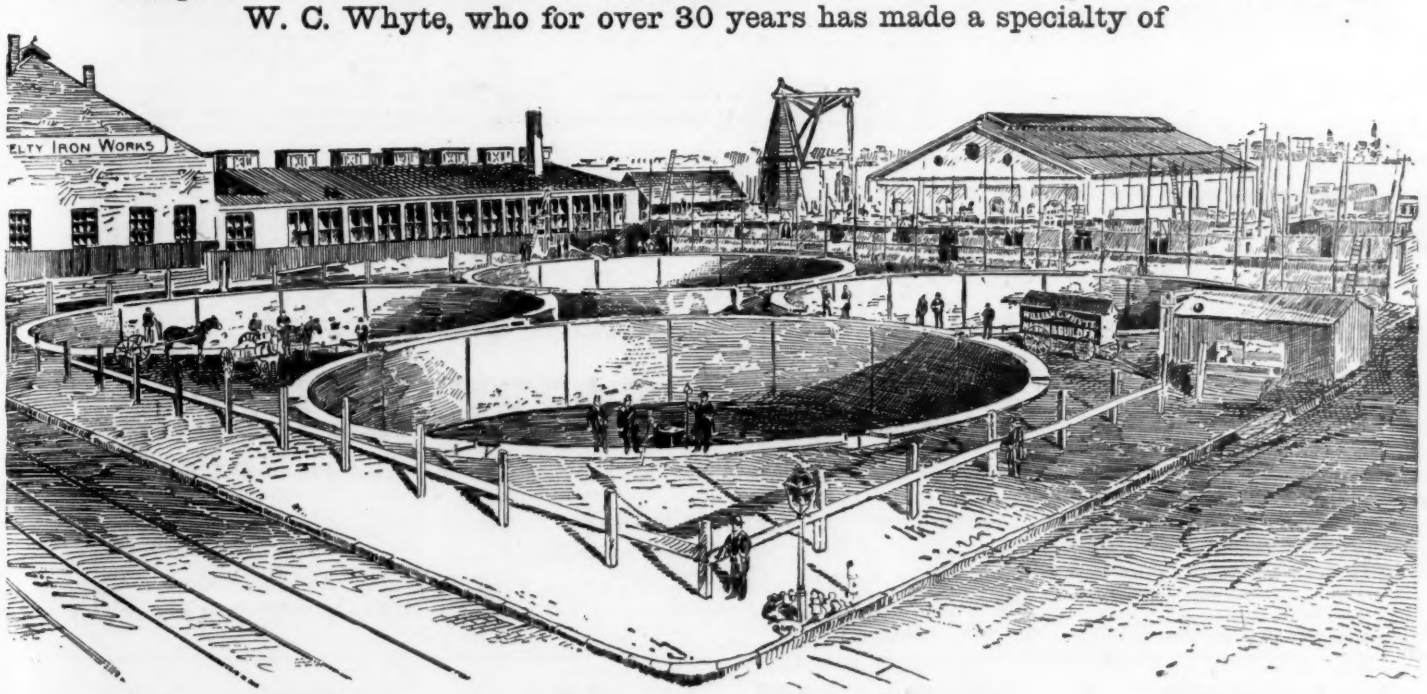

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Erected and in course of construction at present date:

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U. S. A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,900,000
"	1,000,000
Balmain, N.S.W	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co	20,000
"	20,000
Bombay	400,000
Buffalo, U.S.A., Mutual	750,000
" " Citizen	500,000
Brookline, U.S.A.	500,000
Bergen	350,000
Berlin	1,250,000
Bournemouth	1,000,000
Bridgeport, U.S A	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A	1,000,000
"	1,000,000
" Nassau	1,000,000
Brunner, Mond & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A	500,000
Cincinnati, "	1,500,000
" "	1,500,000
Chicago "	3,000,000
" "	1,000,000
" "	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas Works Co	100,000
Cadiz	300,000
Charlottenburg	600,000
Dudley	750,000
Driffield	100,000
Dukenfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A	350,000
Denver, "	500,000
" "	1,000,000
Dusselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z	400,000
Darlington	1,250,000
Detroit, U.S.A	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshutte	500,000
Furth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W	100,000
Grieg	300,000
Georgetown, U.S.A	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havana, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwicke	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A	1,000,000
Ilkeston	300,000
Inverness	200,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kiddermuster	750,000
Kidsgrove	100,000
Konigberg	1,000,000
King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
"	3,000,000
South Metropolitan Co:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U. S. A	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lilie	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U. S. A	250,000
Lawrence "	500,000
Lynn "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N. S. W.	100,000
Minneapolis, U. S. A	750,000
Magdeburg	300,000
Memphis, U. S. A	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A	430,000
Newmarket	150,000
Newark, U.S.A	680,000
Northfleet	200,000
New York, U.S.A	2,000,000
Nice	600,000
Newcastle, N. S. W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N. S. W	100,000
Prescott	150,000
Providence, U.S.A	750,000
"	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburgh, U.S.A	1,500,000
Portland, "	560,000
Pawtucket, "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N. S. W	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N. S. W	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Josephs, U.S A	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A	2,000,000
"	2,000,000
"	1,000,000
Laclede	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubs	300,000
Williamsburg, U.S.A	600,000
"	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A	500,000
Windsor, N. S. W.	100,000
Wolverton	100,000
Wellington, N. Z.	250,000
Whitchurch	175,000
Washington, U.S.A	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A	750,000
Yeadon	500,000
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Elkhart Gas Light and Coke Co.	Elkhart, Ind.
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Morris Gas Co.	Morris, Ill.
Los Angeles Gas Co.	Los Angeles, Cal.
San Diego Gas Fuel and Electric Lt. Co.	San Diego, Cal.
Sioux Falls Gas Co.	Sioux Falls, Dak.
Dakota Gas and Fuel Co.	Grand Forks, Dak.
St. Johns Mutual Gas Co.	St. Johns, Mich.
Stillwater Gas Light Co.	Stillwater, Minn.
St. Paul Gas Light Co.	St. Paul, Minn.
Emporia Electric and Gas Light Co.	Emporia, Kas.
Van Wert Gas Light Co.	Van Wert, Ohio.
Lansing Gas Light Co.	Lansing, Mich.
San Francisco Gas Light Co	San Francisco, Cal.
Shelbyville Gas Light Co.	Shelbyville, Ind.
Great Falls Gas Light Co.	Great Falls, N. H.
Belleville Gas Co.	Belleville, Ontario.
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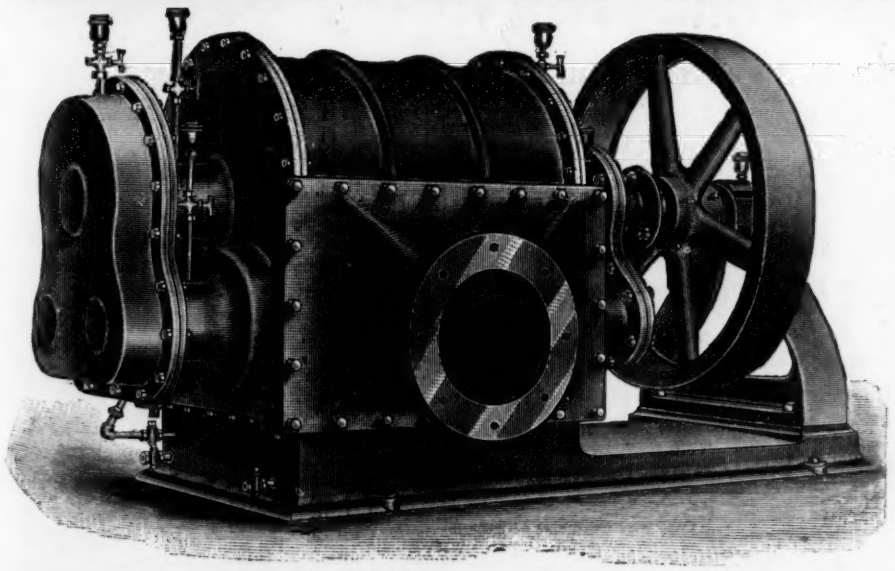

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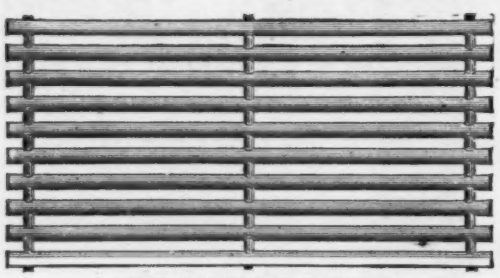

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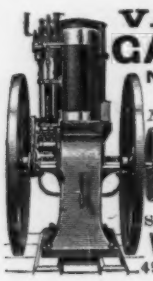

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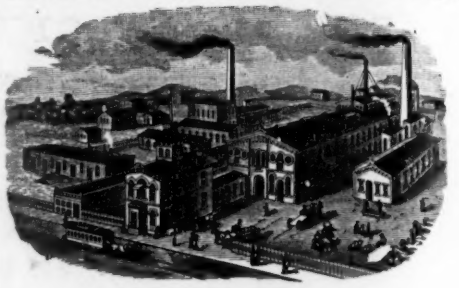

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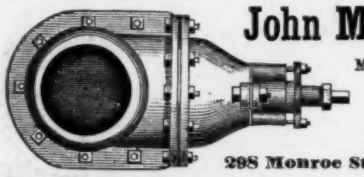

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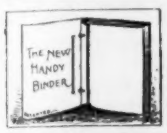

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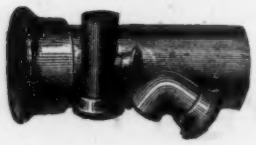

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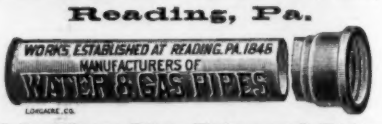

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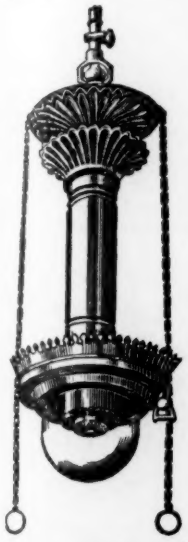

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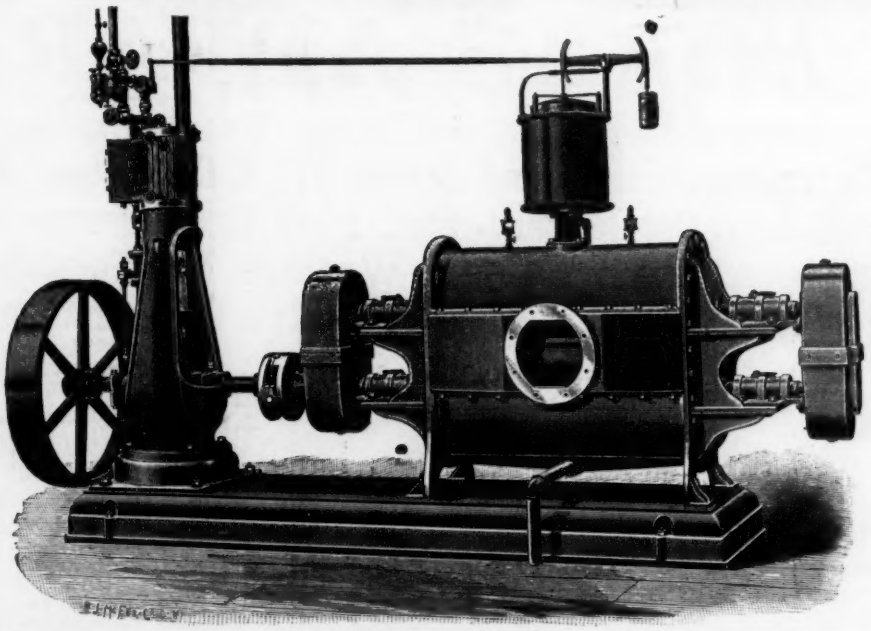

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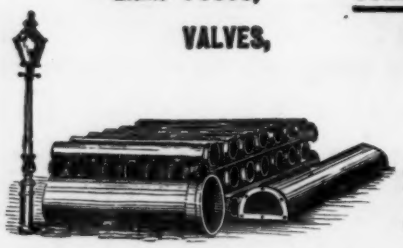

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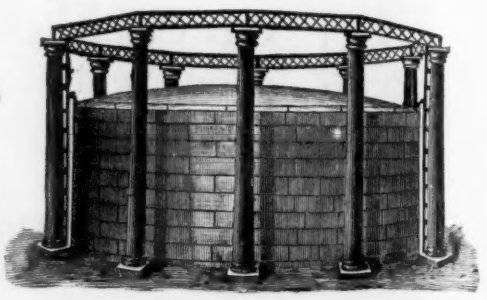

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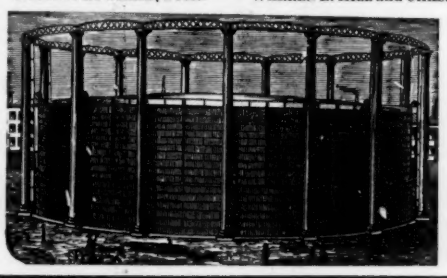

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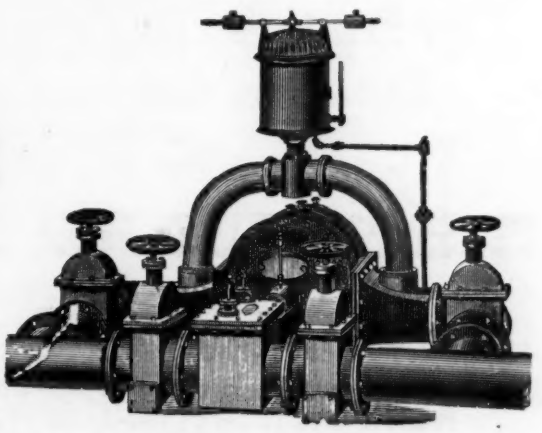

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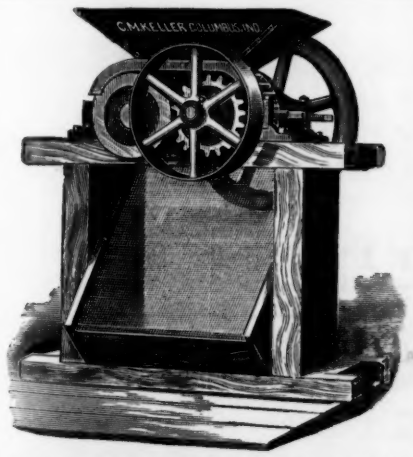

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4,500 lbs. Indiana nut and slack, at $1.30 per ton	$2 93
Engineer, one night, at $50 per month	1 67
Trimmer, one day, at $40 per month	1 33
Superintendent or Electrician, one day, at $50 per month	1 66
Waste, etc., one day, at $20 per year	05
Water rent, one day, at $40 per year	11
Wheeling coal and removing ashes, at $4 per week	58
100 pairs carbons, at $18.50 per 1000	1 85
One pint cylinder oil, at 60 cents per gallon	07
One quart engine and dynamo oil, at 50 cents per gallon	13
Total	$10 38

50-H.P. OTTO GAS ENGINE, Running a Plant of Fifty 2000 C.P. Arc Lamps 12 Hours.	
9,200 cu. ft. gas, at 42 cts. per M. (for cost of gas see items below)	$3 86
Engineer not needed; engine is in care of Electrician or Supt.	....
Trimmer, one day, at $40 per month	1 33
Superintendent or electrician, one day, at $50 per month	1 66
Waste, etc., one day, at $20 per year	05
Water rent dispensed with (cooling water used over and over)	....
Handling of coal included in cost of gas	....
100 pairs carbons, at $18.50 per 1,000	1 85
One pint cylinder oil, at 60 cents per gallon	07
One quart engine and dynamo oil, at 50 cents per gallon	13
Total	$8 95

Expenses of depreciation, repairs, and interest omitted, being considered the same in both cases—though depreciation and repairs are much higher with steam on account of boiler and its appurtenances. Cost of gas in the holder we estimate for most of the Middle and Western States as follows: Coal, 30 cts.; labor, 20 cts.; purification, 2 cts.; total, 52 cts. Less coke, 7 cts., and tar, 3 cts.; leaving net cost of gas 42 cts. The items of Superintendence and repairs, being paid for by the gas sold to consumers, need not be charged on extra output for gas engine consumption. Where the cost of gas is higher than here figured, coal for steam use will be found proportionally higher, and final figures of comparison show same amount of saving.

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